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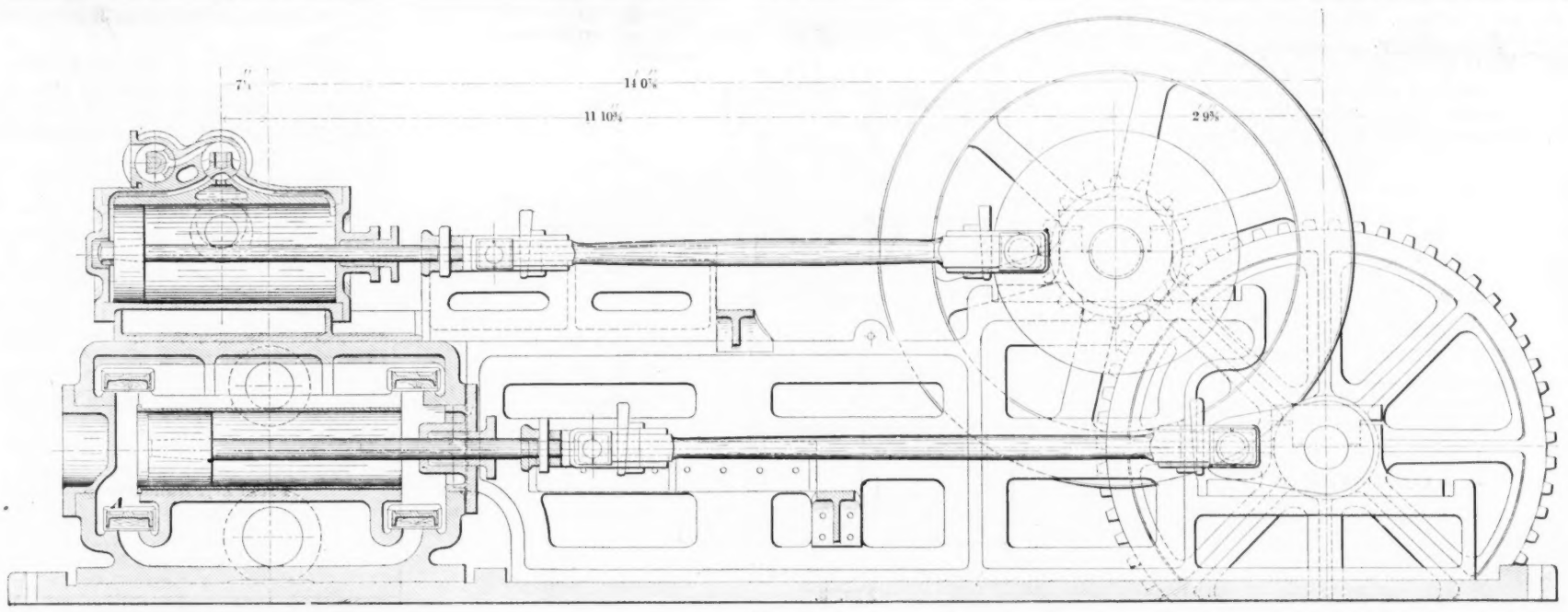
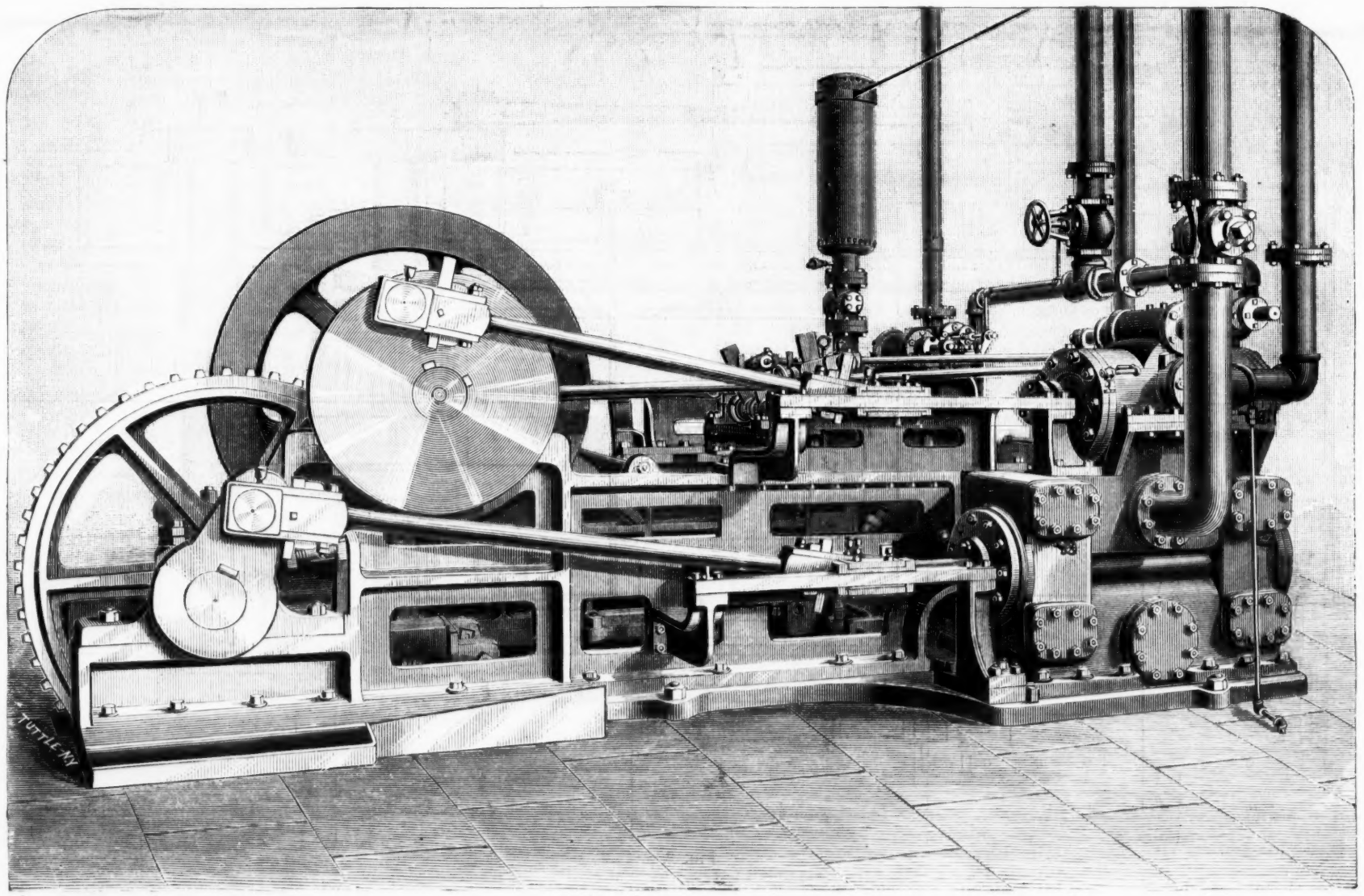


Long. Section on Centre line of Cylinders.

FIG. 1.



MARTIN'S NEW DOUBLE PUMPING ENGINE.

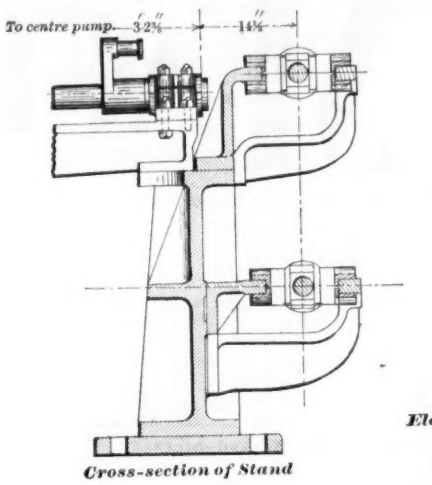
New Water Work's Pumps.

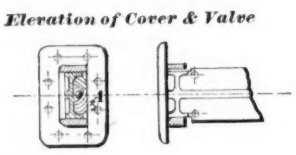
Nothing is better understood by those accustomed to the operation of pumping machinery, than the fact that one of the most difficult mechanical problems is the economical and satisfactory handling of a column of water. One of the sources of loss in the more common forms of pumping engines is the result of the necessarily slow piston speed of the steam cylinder, when the speed of the steam and water pistons is the same, the loss being directly due to the slow speed, and indirectly to the fact that the benefits of high grades of expansion cannot be realized. In a crank and fly wheel pumping engine of this class, unless the fly wheel is of enormous proportions, it is of comparatively little value in distributing the power, while the reciprocating parts, owing to their slow motion, are

of no service, so that the stroke is commenced and completed in a hard, jerky manner, with a surging of the water column destructive to the machinery, and quite the reverse of economical, which action is further increased by an attempt to work with any considerable expansion, or at increased piston speed.

In the accompanying engravings (pages 1 and 2) is represented a pump designed for city water works, or for any service where large quantities of water are required to be pumped either under ordinary or exceptionally high pressure, the object contemplated being the providing for high steam piston speed and a fair grade of expansion, together with such action as will permit reasonably high pump piston speed, and at the same time bring about a smooth motion of the water column, without destructive shocks to the machinery.

Referring to the engravings, Fig. 1 represents a longitudinal section, and Figs. 2 and 3 represent respectively a plan or top view, and cross sections at different points,





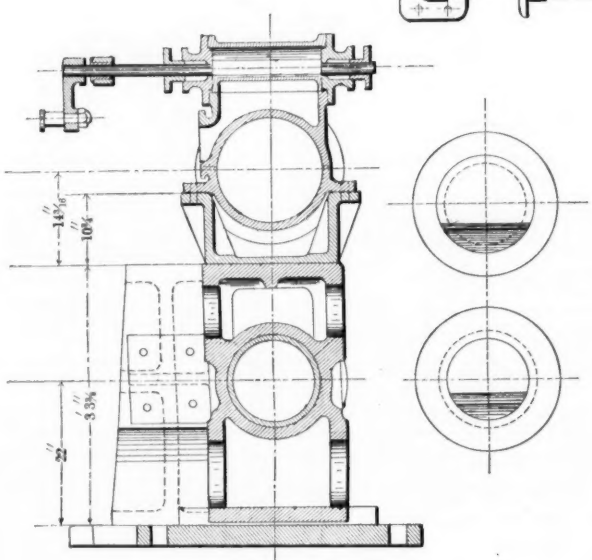
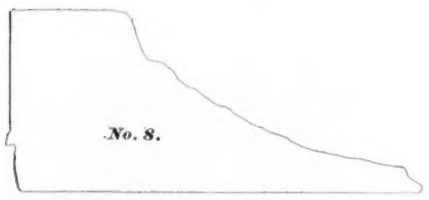
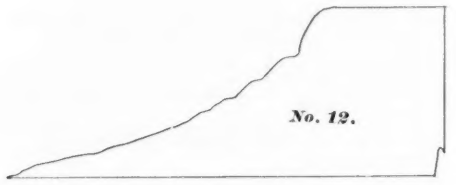
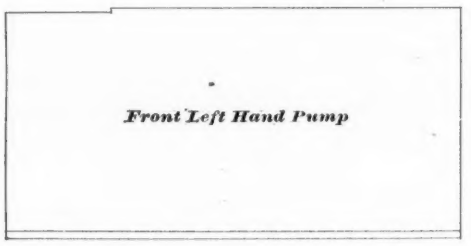


FIG. 3.







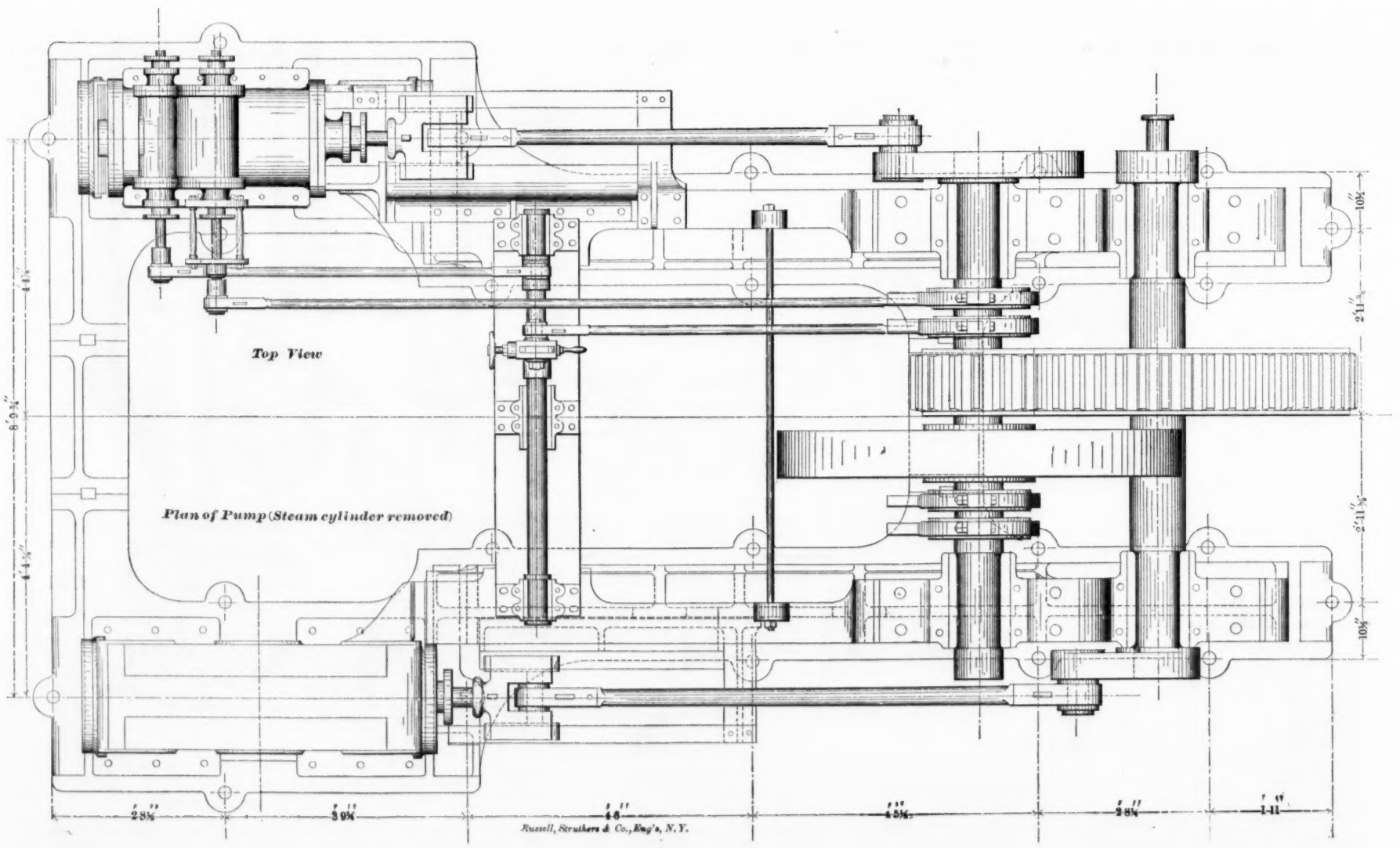


FIG. 2.

together with other detail. It will be seen that there are two steam cylinders, connected to cranks at right angles on a shaft carrying a fly wheel and a pinion. The pinion gears into a spur wheel on a second shaft, below and back of the main crank shaft, the second shaft being fitted with cranks for connecting to the two water cylinders, situated immediately below the steam cylinders. By this means the steam pistons may be moved at a high rate of speed, while the speed of the water pistons is no greater than is found to be unobjectionable, which, however, from the combined operation of comparatively high rotative speed, the equalizing effect of the momentum of reciprocating parts at high speed, and the effect of coupled engines, with the resulting regular motion, may be considerably higher than ordinarily found advisable. Thus, in the pumps here illustrated, we are informed that 550 feet steam piston speed, with 160 feet piston speed in the water cylinder, is frequently used, the water pistons working against a pressure of 450 pounds per square inch, corresponding to a head of about 1,000 feet, and that under this high speed and pressure the valves lift and close so easily as not to be heard.

The steam valves, both main and cut off, are rotary valves, and are driven from eccentrics on the crank shaft.

The pump valves, as shown in the engraving, are simple blocks of wood controlling ample and direct water passages, and lined on the top and sides with a thin casing of metal for the purpose of giving them the necessary weight, and also to prevent wearing in the guides between which they work. These valves are found, in use, to give entire satisfaction, a set of them made from soft maple wood having been used, in one instance, day and night for five years with no signs of requiring renewal, which, however, can at any time be done at an expense merely nominal.

Another feature of this construction is, that should any slight repairs or packing be required in either of the steam or water parts, that particular part can be disconnected for such repairs or packing while the other can be run independently, thus making an entire stoppage of the water supply almost impossible. A very important consideration in the water supply of cities or large industrial establishments.

The indicator diagrams from steam cylinder were taken from the Cleveland Rolling

Mill Company's water works pumps, of four million gallons capacity, which have been working day and night for two years without having been opened. The diagrams have been reduced to one-half their original size. The following data are applicable to these diagrams:

Diameter of cylinder.....	15 inches.
Stroke of piston.....	30 "
Revolutions per minute...	62
Boiler pressure	50 pounds.
Indicator spring.....	20
Pressure in water cylinder.	160 "

Diagram No. 12 from front end, and No. 8 from back end of left-hand cylinder.

The pump diagrams are from a water cylinder in constant use, and are published to illustrate the correct action in the water cylinders of these pumps.

As may be gathered from the foregoing, this construction is not an untried arrangement; on the contrary, the designer, E. H. Martin, engineer for the Cleveland Rolling Mill Company, has put them to the severest tests in use for that concern, and invites any one interested in such matters to make for themselves such tests as they may desire. He has entered into arrangements with the Cuyahoga Steam Furnace Company, of Cleveland, Ohio, by which they will manufacture these pumps in any size, and for any purpose. We understand from the inventor that he is prepared to guarantee *an ordinary working duty* of eighty-five millions foot-pounds per hundred pounds of coal.

Shop Kinks.

No. 34.

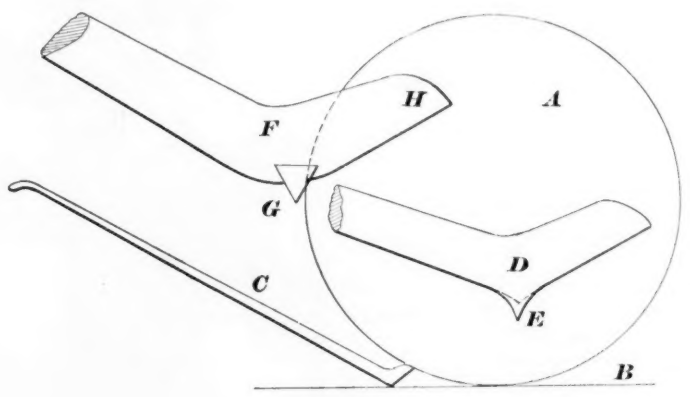
By Lewis F. Lyne.

PINCH-BARS.

Pinch-bars may be considered by some a rather tame subject to write upon, but when an individual has found himself ordered to the round house to reduce side rod brasses, or perform other work upon a locomotive that requires him to move the machine with a dull or poorly made pinch-bar, he can readily comprehend my position, and is in a condition to appreciate my feeble efforts. The writer has on many occasions, in company with a fellow workman, hunted the premises all over to find two pinch-bars that could be used without material danger to life or limb. After a selection was made, and each had taken possession of a bar, an effort was made to move the locomotive. When the bars were placed in position under the wheel, and pressure applied at the end of the bars, gently at first, it was found the bars held reasonably well. When more power was applied the bars slipped and a kink was put in our necks which would last us a month or more.

In railroad shops one will usually find as many different ideas upon the shape of pinch-bars as there are upon chipping hammers, and I never knew two men to fully agree upon the latter. Some claim that a pinch-bar should be sharp upon the point so as to grip the wheel, but this class comprises a very few persons, who have very little pinching to do. Others—and I may say the majority—claim that a pinch-bar should have a sharp heel and a well-rounded point, something like the one represented by *D* in the accompanying cut, *E* being the heel. The other end of the bar is usually bent, as shown by *C*, to prevent the fingers from being jammed in case the bar slips when near the floor, *A* representing the driving wheel, and *B* the rail. When a bar becomes dulled from use (which will be very soon, as it is very difficult to get a bar made with a well-tempered heel), it is taken to a grindstone where, after a short time, the heel assumes the form indicated by the dotted line near *E* in the engraving. When a pinch-bar gets into this shape, look out for kinks in your neck while using it.

About six years ago, while employed in a railroad shop, I had a steel pinch-bar made like the one shown at *F*. The point was well rounded, but instead of the usual sharp heel I had a dove-tailed slot planed in it to admit a triangular-shaped piece of steel *G*. Two sides of this triangle formed an angle of 60°, and the piece was made of the best tool steel nicely tempered. The piece was slightly tapering to insure a tight driving fit into the bar. One of these steel edges would last for several months in constant use, and when the edge became dull the piece was knocked out and replaced by a new one. As the slots in the different bars were all made to a template, a number of these steel edges were kept in the tool room so that a new edge could be placed upon a pinch-bar in a very few minutes. The dulled edges were ground sharp without drawing the temper, and used until the steel was no longer fit for use. I never heard of a patent upon this method of making pinch-bars, and those herein described have been in use for at least six years, giving entire satisfaction.

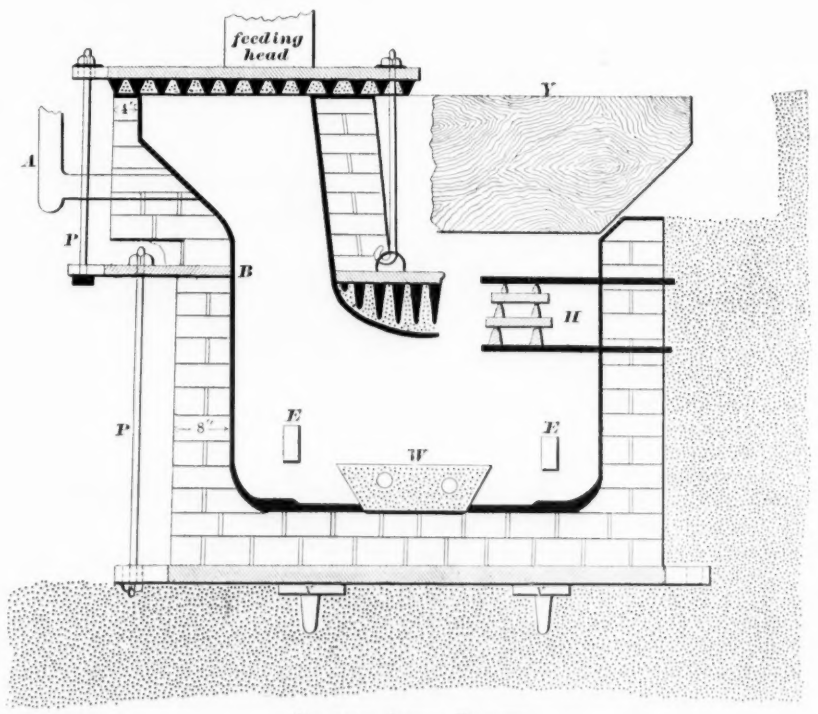


Pinch Bars.

Casting Anvil Blocks.

By Thomas D. West.

Undoubtedly the heaviest castings ever made have been for anvil blocks. One casting for this purpose, made in Russia, weighed 600 tons, while in this country such castings have been made weighing 160 tons.



Casting Anvil Blocks.

The cut represents different ways of moulding anvil blocks. The main point to be considered in making such a class of casting is to have good solid ground bearings and a strong bottom plate, so as to support and not allow the bottom portion of the mould to sink away when the weight of the heavy mass of iron comes upon it.

The heavier the mass of iron the thicker should be the under brick-work. A body of metal that will keep in a liquid state for two hours should not have less than two layers of bricks to form the bottom of the mould, and for each additional hour there should be added a course of brick, until there are six or seven courses, which should be sufficient for any casting. For very heavy casting the bricks that are used to form the face of the mould should be good, first-class fire-bricks of a soft quality. For the bottom part of the mould, it is better to have at least two courses of fire-brick.

It is better to use an iron curb when ramming around the sides of such moulds, than to depend on an earth or brick pit.

For bolting together heavy anvil moulds strong binders should be placed under the bottom plate, as shown at *X X*, and similar binders should be placed over the top of the mould. Binding the mould by large surface plates, with bolts through the handles of the plates, as shown at *P P*, is not a very safe plan, as it gives the center of both plates a chance to spring.

Sometimes there is an iron cross used over the top plate, and, by having the lower plate handles project out far enough, slings or chains are hung down from the cross, and when hitched to the lower plate handles the cross is hoisted up until the slings or chains have a strain on them. Then blocking is wedged between the cross and upper plate, by which means the mould is held together without bolts.

The foundation plates for building such moulds upon are made from 2″ up to 5″ thick.

The casting of very heavy anvil blocks is generally done on the spot where they are to be used, and after they are cooled the block is turned over by means of wrought or cast-iron trunnions, cast into or on the block.

The common plan of making ordinary anvil blocks is shown at the left-hand side of the cut. An 8″ wall is built up to within about 6″ of where the pattern begins to extend out, and, after a joint is partly formed, a center plate or ring *B* is bedded on; then the balance of the mould is bricked up. The reason for using the center plate is to save the work and the drying of a 16″ wall, which must be built if this plate is not used.

Another plan is to build only the straight portion of the mould in loam, and when this is dried and rammed up level with the top of the brick-work, then set on the top portion of the wooden pattern, as shown at *Y*; then ram up the balance of the mould with green sand. After the pattern is drawn and the green sand portion of the mould finished, the mould can be covered with a loam plate or a dry sand cope, and if it is not convenient to bolt down the covering it can be held down with weights. This method of moulding is adapted to save labor and time.

Sometimes anvil blocks are cast open, that is, without having any covering or cope on them, and sometimes there are heavy anvil blocks cast in blast furnaces. The mould will be made in loam in the floor, and there dried, and after it is dried the outside of the mould is rammed up. When all is ready the anvil block is cast, there being no cover or cope over the top of it.

For casting anvil blocks wanted in a hurry, time could be saved by making a loamed plate and having it dried by a fire underneath, then set this plate on a level bed down in the hole. The pattern could be set on this loamed plate, and then the entire height of the anvil block rammed up with green sand; that is, providing the sand is good enough. By this means the bottom would be formed with loam and the sides of green sand, and although the sides might look rough there would be a smooth bottom.

The section of a loam core shown hanging to a section of the loam plate covering illustrates the way a large heavy anvil block was made upon which I worked about 20 years ago. This core was put in for the purpose of giving a large base, with little metal. At least, I think that was the reason.

Another thing sometimes practiced in the casting of anvil blocks is to make some holes about 1½″ diameter through the brick-work, and before ramming up the mould, place in bars of 1″ round or square wrought iron, as shown at *H*. Bearing on the lower rods, pig iron is piled and wedged down by the top bars so as to keep the pigs from floating. This pig iron is placed in the center of the mould to assist in the cooling of the hot metal. The advantage of this can, I think, be readily seen. It is best to have the pig iron that is to be placed in the mould thrown into the cupola just before the bottom drops, so as to have all the rust burnt off from it before it is placed in the mould. In the dove-tailed core, *W*, can be seen two holes. In a corresponding section of the sides of the mould there are also holes made larger than those in the core. When the core is set into its print and placed right, rods are passed through the core from one side of the mould to the other, and then the rods are wedged down by filling up the holes in the mould or brick-work with pieces of brick and stiff loam.

This is a safe plan for holding down the core, and is far better than driving nails into the mould at the ends of the core. *E E*, shows the bottom pouring gates, through which the mould should be more than half filled before any iron is allowed to go in through the top pouring gates *A*.

The faster such moulds are filled with iron the better, and the iron should be on the dull side. The duller they can be poured the smoother the casting will be.

The patterns for such castings should be split, or made in two sections, the piece *Y* being the top section. By being so divided it will give the moulder a better chance to make his casting.

A nice smooth skin on such massive castings is very seldom obtained, and some moulders will say that it cannot be done because of the large body of iron staying in a liquid state so long. It is, however, chiefly because the loam mixture and blacking is not as it should be, rather than because of the heavy body of liquid iron.

It has been estimated from surveys recently made that the dust fields of the Pennsylvania and Reading Coal and Iron Company contain sixty millions tons of coal dust, forty millions of which can be used as fuel. New sifting machinery and coal dust burning locomotives will in the future be the means of utilizing to a great extent, a waste that is enormous.

Locomotive Notes.

BY ANGUS SINCLAIR.

In describing the performance of a locomotive engine recently constructed, a railroad journal made the assertion that 50 per cent. of the heat generated by combustion was converted into work. The coal used contained ingredients, which, when properly consumed, were capable of producing heat units enough to evaporate twelve pounds of water to the pound of coal. The engine evaporated about six pounds of water, hence it was assumed that half the heat generated was utilized in doing work. That is a common mistake which many railroad men get deceived by. Men who make calculations of that kind, and the men deluded by them, overlook the enormous waste of heat which follows the generation of steam. A small percentage of the power represented by the steam generated is used up in pushing the piston, and the remainder is thrown into space by means of conduction, convection, radiation and the exhaust nozzles, especially the latter. When all the losses are summed up, the exact calculator finds that a painfully small proportion of the heat extracted from a pound of coal is converted into mechanical work. Instead of 50%, 12% is nearer the true quantity of heat utilized as a moving force.

The nature of the service performed makes the locomotive an extremely wasteful form of heat motor, and there seems to be no hope of any radical improvement in this respect so long as steam is used in the transmission of energy. But while insuperable obstacles beset the path of inventors striving to radically change the heat-wasting attributes of the locomotive engine, much can be done by intelligent management to curtail its appetite for destroying coal.

The growing practice of publishing performance sheets showing the expense of running each locomotive has developed a spirit of rivalry among railroad men as to who can make out the most economical record. In this emulation master mechanics have naturally bestowed close attention upon the means or methods which produce the best results. For years a disposition was manifested to look to improvement of the machine as the only means of increasing its utility. Of late this sentiment has undergone a change, and the man who runs the engine is now regarded as the most important factor in calculating on economical engine running. At least there is less inclination to magnify machine capability at the expense of human ability.

Parties whose business it is to watch the performances of locomotives can daily receive instructive illustration of the effect which careful management has upon the economical and successful running of engines.

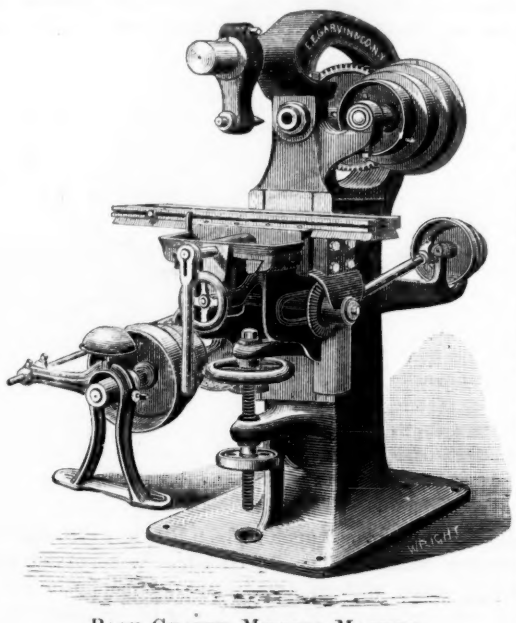
During a recent rush of business on a Northwestern railroad a great many firemen were promoted to the position of engineer, and several of them proved incompetent. An engine which was run by one of the young engineers, and which had previously borne an excellent reputation, began suddenly to lose caste. Locomotives are like men in this respect. They have good and bad characters, and when one loses its reputation much circumspection is needed to regain its good name. This engine, No. 163, was pulling freight over a heavy division, where long grades were numerous. The first complaints sent in against the engine were to the effect that hills had to be doubled through shortness of steam; then came reports of delays and doubling without any defined cause. About the same time the performance sheet began to show that the engine was devouring an extravagant quantity of coal, and boiler repairs increased out of proportion to the work done. The engineer was repeatedly questioned respecting the cause of the engine's sudden depreciation, but he could give no explanation. Under the circumstances, the master mechanic felt it necessary to try a change of runner, so an experienced engineer was put in charge of the engine. Within a few days a decided improvement was apparent in the performance of No. 163, and within a month she had regained her old reputation. The engine did her work without inconvenience to the train service, there was a saving in fuel of about 20 per cent. over what the young runner had used, and repairs decreased one-half. With the old engineer taking care of her, that engine was good for a year's hard service before it became necessary to lay her up for general repairs. Had the young man remained in charge, there would have been difficulty experienced in keeping her going for six months. This represents considerable saving to the company, and demonstrates the advantage of employing competent men to run locomotives. Many cases of a similar nature might be given.

An investigation of the case showed that the young runner started out to make a record as a tearing, rush-ahead engineer. From the time he left a station till he got stalled for want of steam, he would pound the engine along with the reverse lever in the neighborhood of the "corner." When the steam began to drop, he would shut off the pump till the water got low, then he would pull the feed wide open. Shortly after he took charge of the engine a change had been made in the petticoat pipes' position, which disturbed the equalization of draft through the flues. By this means a good steaming engine was perverted into an indifferent steamer. Several changes were made without hitting on the proper location for the pipe which regulates the draft, consequently no improvement was effected on the steaming qualities of the engine. The young runner then resorted to the bungler's method; he bridged the nozzles. Unduly contracted exhaust orifice is always an evil, and an engine generally suffers more from the resulting back pressure than is gained from a small average increase of initial pressure. But it is especially objectionable where the engineer habitually "pounds" the engine, for the intensified blast tears the fire to pieces, preventing the steady generation of steam at the points where it is most needed. This engine was in bad shape for competing with those properly managed. Owing to maladjustment of the petticoat pipe, the draft did not pass uniformly through the flues, so that the heating surface was not evenly utilized. From the same cause the fire was not burned level, and a heavy fire had to be carried to prevent its being "turned" by the intense blast. Then the contracted nozzles choked the escape of steam from the cylinders, and the returning piston was obstructed during a portion of each stroke. A bad record could easily be accounted for under such conditions.

Between the parties who immediately supervise the work of keeping locomotives going and the men who run the engines, there is often found to be some discord upon the subject of exhaust nozzles. One side, with economy in view, endeavors to keep the nozzles as wide as possible, consistent with making steam, and they occasionally err on the side of opening. Engineers on the other hand, with a view to comfort and easy steam making, prefer to have a blast that will cut the fire. While wide nozzles may be all right in ordinary circumstances, the men who pull the throttle like a margin to support them under the adverse circumstances of head winds or bad coal, or any other difficulties which often arise in railroad service. There is no comfort in running an engine whose steaming is seriously affected by every variety of weather and prejudiced by every change of coal. But before requesting the contraction of nozzles, an engineer should make certain that the difficulty is not induced by want of proper draft adjustment.

The draft of a bituminous coal-burning locomotive is subjected to wonderfully complicated conditions. A huge grate area supplies vast products of combustion, which start on their way to the atmosphere through multiplex flues, which open a passageway of 500 square feet or more. An intense blast of escaping steam hurls the said products through a stack contracted to a third of the flue area, and dashes them against an inverted iron cone. Any energy that is left in the combustion products after striking the iron cataract, is expected to creep into space through the meshes of a soot-begrimed netting. The necessity for some draft outlet is sort of half-heartedly admitted, but the opening allowed must be of the most tortuous character.

The arrangement of the draft obstructions must be so regulated that the currents from the fire-box will pass evenly through all the rows of flues. Any change which interferes with this will prove prejudicial to steam making. Every engineer of any experience knows how readily a small change of petticoat pipe position will affect the steam. I knew a case where an engine that was reputed a good steamer suddenly changed so much that it was a hard matter to get steam enough to pull a moderate train on slow time. There had been no change of crew, and nothing was done to the engine that was likely to injure her steam-making qualities. An experienced engineer was in charge, and he was driven almost to his wit's end before the discovery was made that the cone was fastened obliquely in the stack.



BACK GEARED MILLING MACHINE.

Back-Geared Milling Machine.

The cut herewith presented illustrates one of the late designs for a heavy milling machine, made by E. E. Garvin & Co., 139, 141 and 143 Center street, New York.

The spindle of this machine is powerfully geared, driven by a cone pulley of large diameter, with three changes of speed for a 3 in. belt.

The out-board center is fitted to slide upon a heavy arm secured to the head. The spindle boxes are of bronze, with every adjustment to compensate for wear.

The table has a feed of 16 in., with an adjustment, in and out from face of column, of 5 inches. The feed is operated automatically by a worm, in connection with a rack and pinion, which are entirely protected from exposure to dirt and chips.

In addition to the power feed there is a lever connection with the rack-pinion, giving, when desired, a quick moton to the table.

The table with feed work is supported by a substantial knee, scraped and fitted to face of column, with a vertical adjustment of 11 inches.

The machine, when ready for shipping, weighs 1,300 pounds.

New Artificers' Telescopic Plumb, Level and Target.

Running lines in new buildings for setting machinery and hanging shafting, is a very tedious operation when the work has to be prosecuted with lines stretched between the several points or extremities.

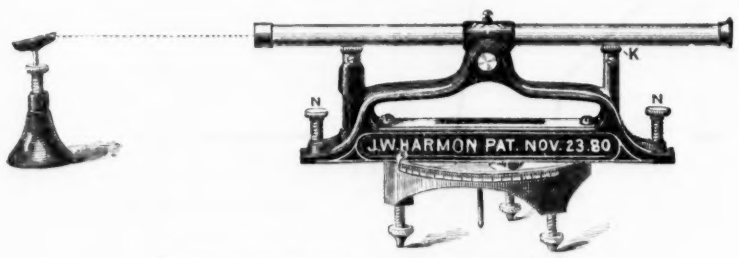
The details as usually executed are all liable to introduce errors which may not be discovered until too late to rectify them, besides occupying much more time than ought to be required to do the work, yet it has been necessary to continue the use of the line in the absence of something better to take its place.

In some instances where an engineer's transit or level has been at hand lines have been run very expeditiously, but such instruments are too expensive to become a part of a machinist's or carpenter's kit of tools. To fill the requirements of such an instrument without incurring the cost has been the object of the inventor of the very useful little instrument shown in the engravings presented herewith. It consists of a neat cast-iron frame, having two spirit levels inserted at right angles to each other, the largest to be used as a level for running horizontal lines and the smaller one for laying out or sighting perpendiculars. A telescopic sighting tube with cross wires and without focussing attachment is attached to the upper part of the cast-iron frame, precisely parallel to the base of the instrument. This tube is adjusted and secured by means of the screw *K*.

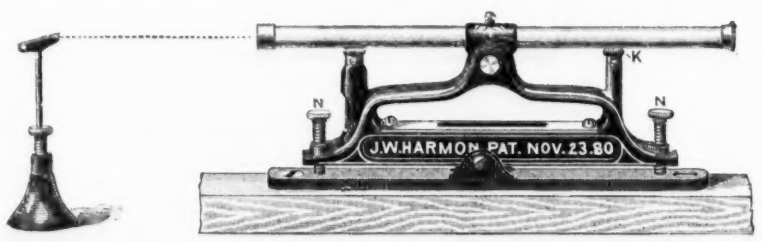
The instrument is pivoted upon a circular stand, which may be adjusted exactly level by means of three thumb-screws.

The edge of this stand is graduated in degrees from zero to ninety degrees, so that in laying out lines for shafting or for foundations for buildings lines may be run at all angles without moving the instrument. A slanting plane may be obtained by adjusting the screws in the stand to suit the requirements. The center pin designates the plumb-line, from which all measurements are to be taken.

For laying out a long line for shafting, say from 200 feet to 300 feet, place the level at one end and set it exactly level, then place the target at the other end and locate the two



TELESCOPIC PLUMB, LEVEL AND TARGET.



ATTACHMENTS FOR GRADES AND INCLINATIONS.

ends of the line. The intermediate points may then be easily determined by sighting. The top of the target should be placed so that the least ray of light may be visible between the top of it and the cross hairs. Thus it will be seen that this instrument renders the use of lines unnecessary, and guesswork is avoided.

In moving buildings and building bridges, the use of the sighting tube enables one to locate points and lines with ease and certainty. The various other uses to which this instrument is adapted will readily appear in practice.

An attachment is furnished with this instrument by which it may be easily attached to a straight-edge. It consists of a piece of cast iron, as shown in the engraving, to the center of which the instrument is pivoted by a screw passing through the base; the level is then adjusted parallel with the straight-edge by the screws, *N N*. The attachment is of great service whenever a long bearing is required, or in determining more distant grades and greater elevations.

To get an elevation, the inclination to the foot can be easily measured from one end of the base to the straight-edge, adjusting the inclination of the level by the screws alluded to. Elevations may also be determined without the attachment, by measuring with a rule from one end of the base to the board or plank upon which the stand rests.

This instrument is being introduced by G. S. Woolman, 116 Fulton street, New York.

Improved Boring and Turning Mill.

Notwithstanding one of the most popular of modern machine tools, in shops where it has come into use, is the boring and turning mill, there are yet many who look upon such a tool as only adapted for a special class of work, and hence likely to remain idle in the ordinary machine shop for a large part of the time. This, however, is not the case with those who have been accustomed to its use, it requiring but a short time to convince the most skeptical that about the last tool to be out of use for any length of time is a well designed boring and turning mill. No one will question the superiority of this tool on heavy work, the facility with which the work can be adjusted no less than the rapidity of operation being generally conceded. It is not, however, so well appreciated that the conveniences of this tool adapt it to many kinds of light work, the saving in time alone being an important consideration.

The accompanying engraving represents a fourteen foot boring and turning mill, built by the Niles Tool Works, Hamilton, Ohio, which will be recognized as a substantial and convenient tool of its class.

In this machine the table is driven by spur gearing cut from solid metal, which gives a very equal motion, and one free from a tendency to lift or chatter. The table is fitted with a heavy spindle running in adjustable boxes. The bottom of this spindle rests on a steel step, which is adjusted for height by turning the small screw head seen near the bottom of the base at the front. For ordinary and light work the weight of the table is carried by this step. To provide for heavy work an annular bearing under the outer edge of the table is brought into use, by relieving the step.

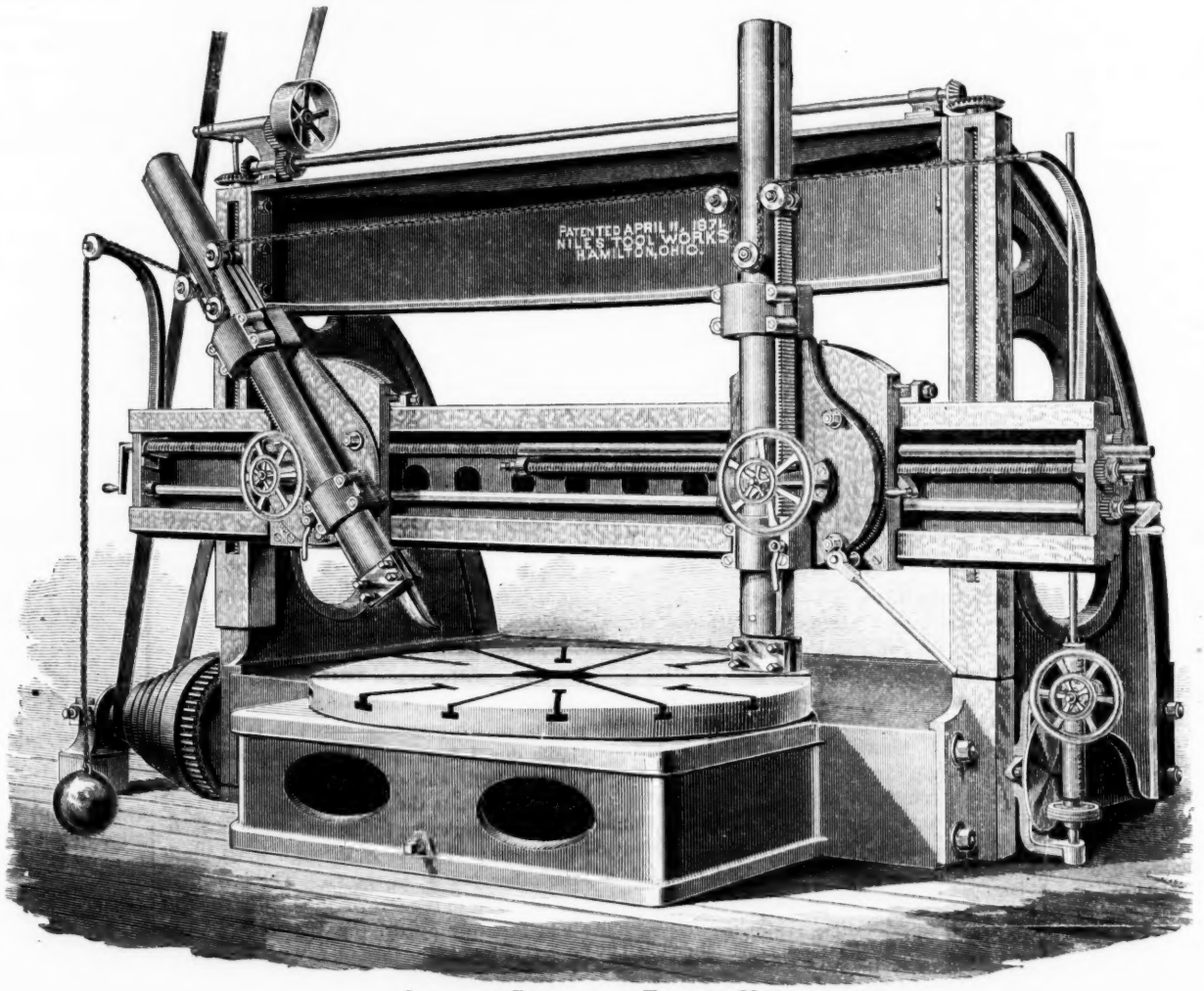
The driving belt is at the side of the machine, being as easily reached and handled as a lathe belt.

The heavy cross rail, of a box-girder form, is raised and lowered by power.

The tool bars can be set at any desired angle, and the feed, which is automatic in all directions, is graduated from the coarsest to the finest by the simple operation of a conveniently placed hand-wheel, the same wheel also operating to change the direction of the feed. The tool bars can both be operated from the end of the rail by hand, either together or independently, and are counterbalanced in such a way as to produce an effect in line with the bar at whatever angle the latter may be set.

The saddles are made right and left, so as to be worked close together when it is desirable, and the right-hand one has quick traversing movement by hand, in addition to the slow hand movement and feed.

All sliding fits are scraped to a bearing, and the tool bars are ground cylindrical. The tool holders and shafts are of hammered steel, and the bolt and nuts are case-hardened.



Improved Boring and Turning Mill.

The Demand for Cars.

The regular car manufacturers appear to be well supplied with orders, and a great many new cars are also under way in the road shops. These latter are mostly freight cars. The prospect of a dullness in this industry, which was apparent a few months ago, has ceased to excite uneasiness, in view of the big cereal crop that is maturing, and the possibilities of a car famine when the pressure comes for moving it. Passenger traffic also is likely to be well sustained. The summer excursion travel is enormous in the aggregate, and calls for a large equipment of cars to meet a constantly increasing demand. In the present development of the industrial and productive resources of the country, a collapse in car building would be an anomaly not easily accounted for.—*National Car Builder.*

We take the following paragraph from the half-yearly report of the engineering trades, by Matheson & Grant, London:

Locomotives and Rolling-stock.—The activity which has prevailed among locomotive builders for the last year still continues, and orders for all sorts and sizes of engines for Indian, Colonial, and foreign railways, as well as for home lines, fill the factories, so that it is now difficult to make contracts for delivery earlier than next spring. The prosperity of this branch of trade is shared by Continental makers also; and in America the demand for engines is so great that prices have nearly doubled within the last two years

Hereafter the employees in the chain works, Beaver Falls, will not be charged ten per cent. for any money advanced. Mr. Oliver says he did not know this was ever done. The men will get their pay every two weeeks instead of four.—*National Labor Tribune.*

It is a bad policy for employers to advance money to workmen except for extraordinary reasons. The habit once acquired of spending money no faster than it is earned, thereby keeping out of debt, gives a workman more than ten per cent. advantage over his neighbor who gets the same wages but keeps in debt to the butcher, the baker and the candlestick-maker. Let pay-day come once a week, if possible, but discourage the credit system.

LETTERS FROM PRACTICAL MEN.

Mr. West's Theories.

Editor American Machinist:

The iron moulders of the country have much to thank you for in the attention and valuable information you give to the trade. Of all the science-trade papers in the country, yours is the only one in which we find in the practical matter of melting and moulding iron facts that can be readily understood and applied. The articles heretofore contributed by Mr. West have been of much interest, but his latest one, that in your paper July 22d, very unfortunately shows a tendency on his part to leave the realm of the practical for that of the theoretical. This is to be regretted, not only because his theories and speculations are of no value to us, but because unpractical scientists can, in this their own field, "beat him out of his boots." He tells us that ice floats on water, and that an iron vessel will not sink, and gives the reasons therefor (a small cargo of coals for Newcastle, as nine-tenths of even schoolboys know these things); but seems greatly puzzled because solid iron will float on molten iron as ice will float on water, and promises to investigate the matter and try to discover the cause. Now, Mr. West need not make any troublesome investigation. If he will go to any metallurgist who thoroughly understands his profession, or to the science teacher in any of the polytechnic schools, he will be told the reason, and that, too, with a flood of the jargon of science that will make his head swim.

In speaking of weighting down copes, he gives three causes as tending to force the cope up, but says it is impossible to give any rule as to the weight necessary to be put on to keep the cope down, and says one must depend on one's own judgment All moulders are not possessed of as good judgment as Mr. West, and it would therefore be well to have something more reliable than guesswork to govern them. Now it is certainly a fact in moulding, as in other things, that when you know precisely the cause it is entirely within your power to control the effect. He says there are three distinct causes governing the uprising of the cope, viz., the height of the head; the velocity with which the iron comes against the cope; and the number of square inches in the surface of the cope. I contend that if this is all, we can easily get a rule for weighting down flasks. It will not take many experiments to find the difference in pressure between a head six inches and one ten inches high, and when ascertained we have control of his first cause. The velocity with which the iron comes against the cope can be controled and regulated by the number of gates cut from the down-gate. The number of square inches in the surface of the cope is only a matter of measurement. So with the three causes so plainly before us as these are, it would be but a slight matter of calculation to find at all times what weight would be necessary to hold a flask down. I fear, however, there are other and more complicated causes than these, which tend to force a cope up. If Mr. West, though, thinks these are the only ones, he might make the experiment of pouring a plate say six feet square, with a certain heigth of head and number of gates cut from the down-gate, and then give us the rule as to the amount of weight necessary to hold the cope down. It would also be well to give the diameter of the sphere. This idea of putting on plenty of weight is all very well, but how often have we seen moulders put on even more weight than was thought to be necessary, and in the end find that they had not put on enough?

His plan of weights, although an old one, I consider is very good, not only for the convenience of breaking them up, but for getting the hand under to wedge down bars or chaplets. If I were making them, and with a view to subsequently breaking them up, I would take into consideration the possibility of the foundry-man having no drop to use in breaking them, and I would put the cores in straight about four inches and then V them. A man could then take a sledge and plug and "feathers," somewhat similar to those used in quarries, and break the weights very easily.

His plan of bolting down copes is a good one, and has long been known to foundrymen of even limited experience. But his description of moulding in a damp floor would lead one to believe that his experience in our trade had been gained out on the prairies, where land was cheap and Italians at a discount. His plan of a double cinder bed is, I think, a very crude way of over

coming the difficulty of damp floors. It reminds me of the peculiar working of those fancy theoretical farmers who spend the time they should employ in planting or hoeing, in experimenting to get a solution with which to coat the bottoms of their fence-posts to keep them from rotting; or who build vaults under their barns at a cost of $100 in order to save $10 worth of liquid manure. His digging out for cinder beds, and digging holes at safe distances to drain the water into, would require space of twenty-four feet to make a six-foot casting in. Such a plan may do where land is plenty and labor cheap; but neither of these conditions prevails with us here in the vicinity of New York or in the cities of the Eastern States. It would be much better for a foundryman troubled with wet floors, to put in a brick or cement pit for safety, economy of space and labor-saving. Every moulder knows how it lumbers up a shop to dig out for an ordinary cinder-bed; but when you have to dig down the requisite depth for two, as in Mr. West's plan, and then dig your holes around the outer edge, the matter will be seen to be infinitely worse. Again, I do not consider his slanting cinder-bed a safe way to drain water from a mould. When we consider that sufficient water has leaked in to run through a cinder-bed, what condition will the sand under that bed be in? It would certainly be very soft, and consequently the cinders would sink in the muck and the bed lose its incline or slant, and thus become entirely useless for the purpose intended. And with the bottom bed in this condition, what has Mr. West to screw down his cope to? Nothing more solid than a mass of wet sand and muck! Besides, even if this did not happen, the sand and silt that would work in among the cinders of the lower bed would soon destroy its utility, and then all your trouble, including the "holes dug at distances," would be worse than thrown away.

Where a moulder does not have occasion to use the wet floor frequently, or for other reason does not want to go to the trouble and expense of a brick or cement pit, he can overcome the difficulty by simply digging a well hole under the platform. For instance, take a piece that requires a foundation of 12 square feet; let him dig a hole 6 feet square, from 1½ to 3 feet deep, guided of course by the degree of damp to contend with. Lay two pieces of lumber across, the ends resting on the edge of the pit or well-hole, to rest your binders on. Have two or four openings extending to the outer edge of the top pit, and place a piece of common service pipe in each opening, with a plate under each pipe. Then set your lower binders and covering piece, let them be plates or timber, upon your cross beams, and fill in sand to the proper height. Then lay your cinder-bed and go on with your moulding.

I have made castings of from eight to ten tons weight upon a foundation prepared in this way, with perfect success. The plan insures you a dry floor almost equal to the brick or cement pit, and does away with the need of the lower cinder-bed which would require a skilful man to put in and give the proper incline, and also the digging of holes around your mould, occupying valuable space and putting your shop in a condition not to be admired. Mr. West may object that having a well-hole under the platform would render the foundation unsafe, but in reply I have only to say that I have used this plan, and seen it used very many times, and never knew a mishap to result where even ordinary care was given to its construction.

The difference between Mr. West's plan and mine, is simply this: his foundation plates are beneath the whole business, and if the water runs in in sufficient quantity to require pumping or baling, as he imagines, he has nothing but a soft mass of mud for resistance when he comes to screw his cope down. By my way, by giving the two pieces of lumber a good bearing at each end and placing my foundation on top of them, I am clear of the water entirely, with no possible danger of it undermining my foundation, and when I come to screw down the cope I have something solid to depend on. Of course if the floor were so very damp that the water would rise in the well-hole to the bottom of the foundation, a common hand pump put down one of the pieces of service pipe will give you a means of quickly pumping it out. But while this plan will do very well temporarily, it will pay any foundryman who is troubled with a damp floor to put in a brick or cement pit, or if brick and cement are not easily attainable let him sink a caisson. The loss of one casting of any considerable size will cost him more than the building of the pit.

Mr. West should remember one thing, and that is that iron moulding is different from rose-painting and similar occupations. We do not labor for the love of the labor itself, but for the utility of the article when finished. Having this in view, if he can offer us any suggestions which by putting in practice we will be more certain of perfect castings, or which will simplify and diminish our labor, he will do the trade an undoubted service, and I will be among the first to thank him. But the ventilation of unsound theories and non-practical and expensive plans will only lead inexpert foremen and poor foundrymen into labor, trouble and expense.

D. F. TREACY.

Davenport & Treacy Co., Jersey City, N.J.

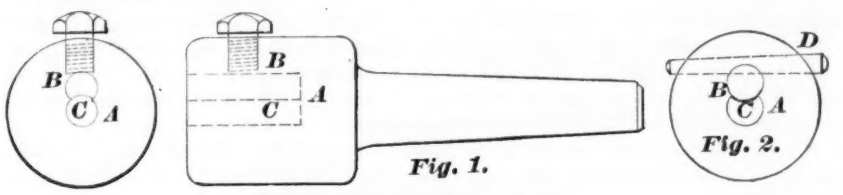
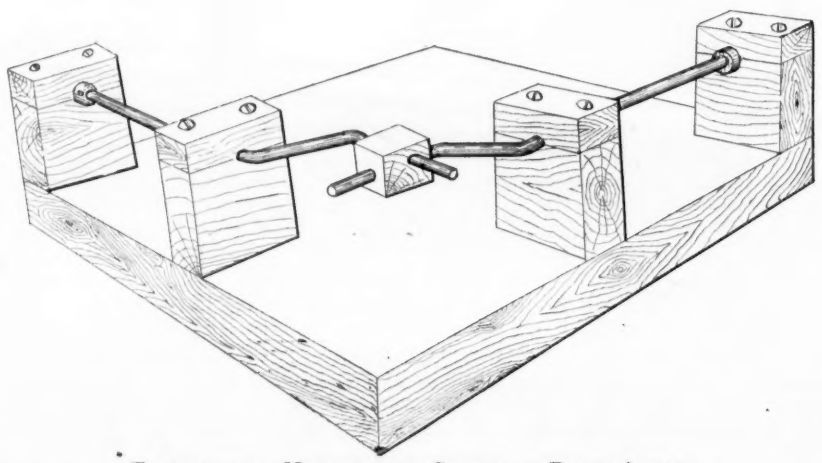


Fig. 1. Fig. 2.

LATHE TAP AND DRILL CHUCK.



TRANSMITTING MOTION, WITH SHAFTS AT RIGHT ANGLES.

Lathe Tap and Drill Chuck.

Editor American Machinist:

I take a great interest in the "Ideas" shown up in your paper and I thought I would help fill up myself. I once wanted something to hold a small tap, and hold it steady and firm. The tap was rather long and had hard work to do. I wanted such a device and wanted it right away, and so made something like the rough accompanying sketch.

It is nothing more nor less than a simple drill chuck constructed in a very economical way. The chuck, *A*, should be of steel; the shank turned to fit the lathe spindle. The hole *B* should be drilled first by holding upon the centers or in an eccentric chuck. The size of this hole should of course be proportionated to the size of drills to be held. The hole *B* should then be plugged with a piece of steel, neatly fitted and cut off flush with the end. After this the center hole *C* should be drilled to fit the drill shank. The plug *B* should then be removed and filed so as to be a loose fit. A hole should then be drilled for the set screw, which may be either flat or pointed at the end, to hold the plug *B* from slipping out. If flat, a place should be filed upon the plug *B*, and when pointed the plug should be countersunk. When finished the plug should be hardened. Some people may object to the set screw, in which case the screw may be left out and a taper pin *D*, shown in Fig. 2, inserted to fill the same requirements. There is this objection, however: a hammer has to be used to secure and release the drill. This tool works splendidly, operating surely and quickly every time. I like it so well that I shall use it to hold all my taps and drills.

A set screw set up against a drill shank to hold it in the socket mars it so that it cannot be removed to be sharpened, and it holds only upon one side. With the set screw the drill bears against the side of the hole at one side, while at the opposite side there is no bearing except upon the point of the set screw, whereas with my plan a much better hold is secured by having an extended bearing surface and the drill shanks are never marked, therefore they will always run true.

To use different sized drills I use "collets" attached to the shank of each drill. This may seem like going to considerable trouble and expense in fitting up, but after the job is finished it will be found a profitable investment.

I use these chucks and drills on regular work, but for miscellaneous and tool work I use universal chucks.

I wish you would say something on the subject of micrometers. I think they are among the greatest inventions of the age. But why don't somebody make larger sizes, say from one inch up to two inches? I would buy the first one as soon as they are put upon the market. They would do more towards keeping standard sizes than all the fixed gauges ever made.

SUPERINTENDENT.

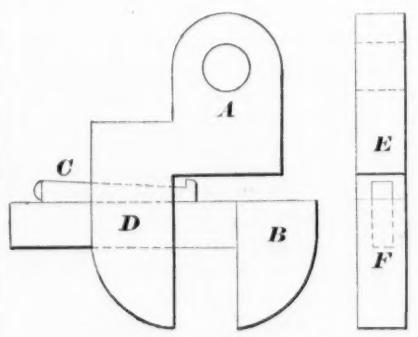
Greenfield, Mass

Adjustable Lathe Dog.

Editor American Machinist:

The sketch presented herewith is that of a lathe dog I have used for a long time, for driving bolts and other square work within its capacity, in the lathe. It consists of a body *A*, which also forms one of the jaws *D*. This has a mortice, *F*, through it to admit the other jaw *B*, as shown. The jaws may be adjusted to the size of the bolt heads and held securely by driving the key *C*. The dog is bolted to the face-plate with a thimble, to hold it away the required distance.

It is a most convenient tool, and will pay for itself in a very short time. By using a soft hammer in driving the key *C*, it will be kept free from burs and in a good working condition.



ADJUSTABLE LATHE DOG.

S. J. WISDOM.

Montgomery, Ala.

Straightening Crooked Castings.

Editor American Machinist:

In No. 31, vol. 5, of your paper, Mr. West has an article on straightening crooked castings.

My experience, of about twenty-five years, is somewhat different from his. In casting a column the thin side is the convex and the thick side the concave side, caused by the thin side shrinking first and drawing the thick side with it, while yet soft, and making it shorter before it begins to shrink than the thin side was at that time. When the thick side shrinks it will be shorter than the thin side, and concave instead of convex.

To make the ends of columns come down, or to make a column straight that is inclined to curl up at the ends, which is caused by unequal thickness, I measure the top and allow it to shrink first, and it draws the lower side with it, the same as the thin side does in the first case mentioned, and when the lower side cools and shrinks it will draw the ends down and leave the column straight.

But I always make the thick part of patterns the longest, or more or less convex, depending on the shape and thickness, and have no trouble in making straight castings.

F. J. NUTZ,

Supt. Ft. Scott Foundry and Machine Co.

Fort Scott, Kansas.

A Right Angle Coupling.

Editor American Machinist:

Inclosed please find rough sketch of an old though very little known method of transmitting motion from one rocking shaft to another at right angles thereto. It will be found very satisfactory for light work in any case in which the angular movement of the shaft does not exceed ninety degrees, in which extreme case the cranks on their respective shafts should move through on angle of forty-five degrees above and below a horizontal plane passing through the axis of the shaft, which should not lie in the same horizontal plane, but in parallel planes at such a distance from each other as will permit the crank pins to pass each other in the coupling block.

It will be readily seen that the block which couples the two cranks, slides and turns on the crank pins, and thus accommodates itself to the varying angles of the cranks.

This contrivance is valueless for transmitting continuous rotation from one shaft to another, but if by any means power be applied to the coupling blocks in such a way as to move it elliptically in a plane bisecting the angle made by the two shafts, continuous rotation of each of them would result: such a motion, however, would probably be more curious that useful.

W. F. DURFEE.

Bridgeport, Conn.

Objections to "Battery" of Boilers.

Editor American Machinist:

As your paper caters to the engineering world, would it not be right and proper to invariably give the true and correct nomenclature in the art or science discussed?

On page 9 of your issue of August 12 1882, in column 4, 52 lines from bottom, you say "a battery of four boilers for the 44th street station," etc.

It passes my comprehension of an experience of over thirty years in boiler building to understand what is expressed correctly by a "battery" of four boilers. Worcester defines a "battery" as "the act of battering; attack." Now, if the boilers are for battering or attacking the "cold wave" as it approaches the 44th street station, you are all right, otherwise not.

Please try and put the proper terms in print, so that the student, as well as the general reader, may know what is meant.

W. BARNET LE VAN.

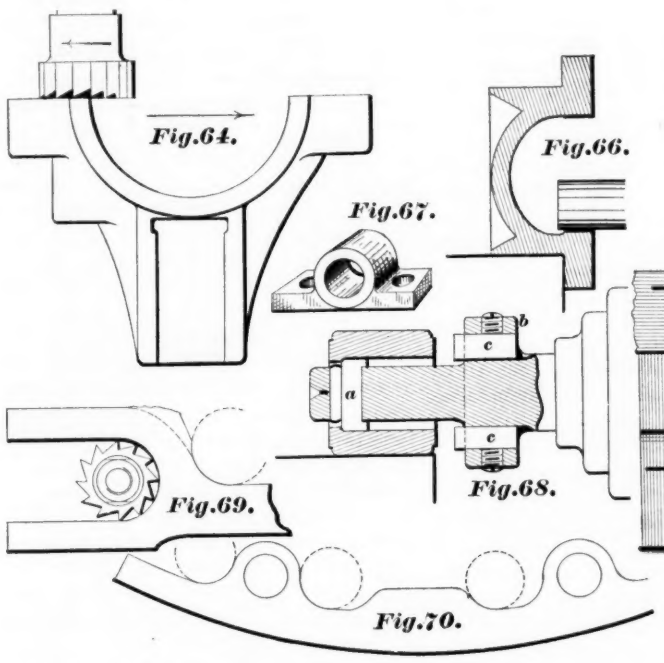
Philadelphia, Aug. 5, 1882.

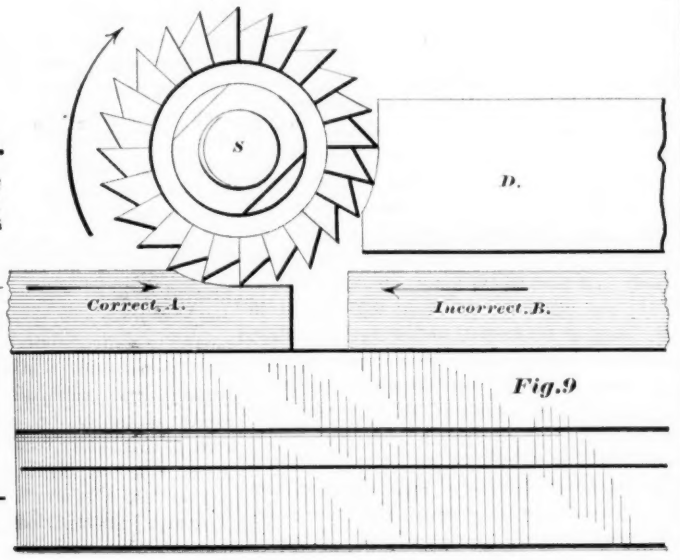
The Catskill Mountain Railroad, running from Catskill to Palenville at the foot of the Catskill Mountains (16 miles), has been completed and is in operation.

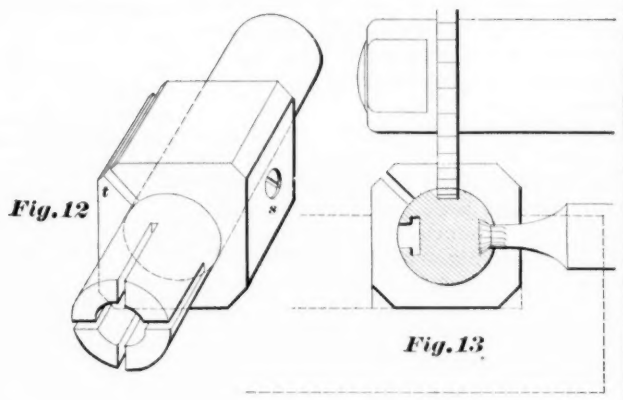
The rails used on most railroads in this country are 30 feet in length, and the heaviest weigh 60 pounds to the yard. Several roads are now introducing a rail 60 feet long, and as soon as the new mill in Chicago is fairly in operation rails 120 feet in length are to be manufactured and tested on one of the North-Western roads. Rails become battered at the joints long before the body of the rail is much worn, and it is believed that the wheels under the cars will wear a third longer on a 120 foot rail, they being more worn in pounding the ends of the rails than in the actual turning of the wheel.

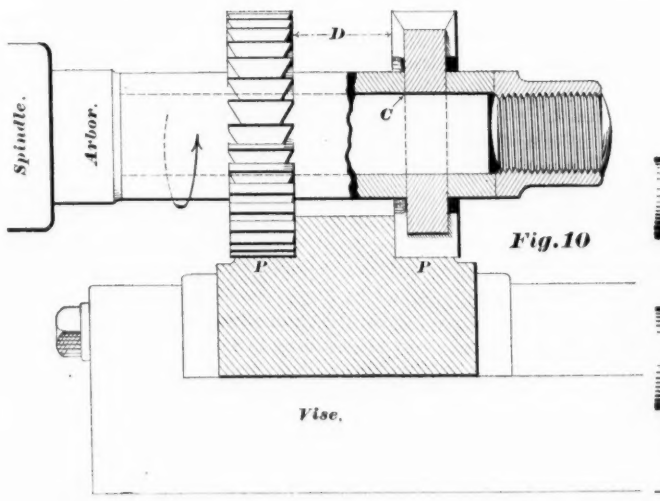
tive direction of the cutter, it is obvious that the cutter cannot dig into the work, as it is liable to do when the bed is moving in the direction indicated by the piece *B*. Besides, in this latter case, every tooth of the cutter must necessarily pass through the hard surface of the metal. It often happens that the work is operated on as represented by *D*, the feed being effected by raising the knee when the work is on the side of the cutter moving downward, as it should always be, in order that it may have a rigid support. When it is on the other side, it is clear that the action of the cutter tends to lift the work, and that any play between the bed and saddle must be somewhat detrimental to efficiency. * * * *

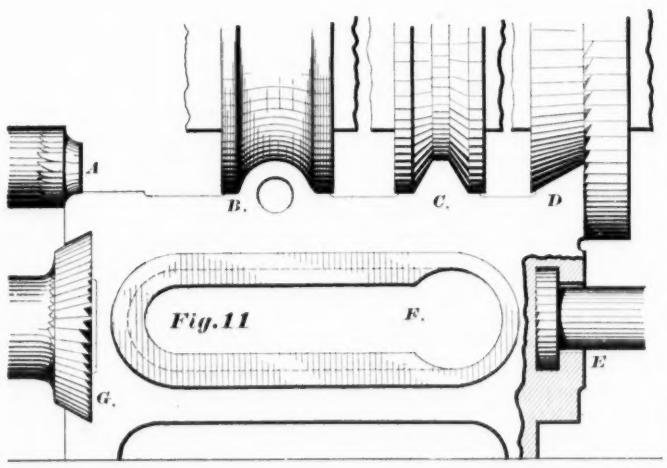
with an ordinary cutter, must necessarily vary in form as the cutter is sharpened by grinding. To obviate this, patent cutters, as described on page 76, and which may be sharpened by grinding without altering their form, may be used. The operations represented at *C* and *D* need no description, while at *E* is clearly shown the method of milling a T slot. The cutter for this is formed on the end of the shank, as shown, and is passed through the work after a straight slot, somewhat wider than the shank, has been cut to the full depth of the intended T slot. *F* represents an operation of a similar nature; the central portion of the stock being cut out with an end mill, and an entrance made for the cutter. Common examples of this and











Uses of the Milling Machine.

The following extracts from "A Treatise on the Construction and Use of the Universal Milling Machine," are by permission of the publishers, the Brown & Sharpe Manufacturing Co., who have just issued the volume:

Fig. 9 is illustrative of a plain milling operation. The cutter is held on the arbor *S*, and in all cases when running forward, revolves in the direction indicated by the arrow. The work should always move as represented by the piece *A*; for the reason that the surface of all forged work is generally hard and dense, and that of castings more or less chilled and covered with abrasive substances, that rapidly impair the efficiency of the milling cutter. In the case of the piece *A*, as soon as this hard skin is once broken through, the teeth of the cutter, in commencing the cut, impinge the softer metal, and when the hard scale is reached at the end of the chip, it is in a manner pried or broken off; and thus the cutting edges of the teeth escape the injurious effect of contact with the hard surface. Again, as the movement of the feed is contrary to the rota-

If a piece of work is to be milled, as shown in Fig. 10, and it is essential that the distance *D* be kept uniform, it is necessary that the distance should be capable of reduction, to compensate for the wear and grinding of the cutters. When this distance is considerable, a number of washers of different thicknesses are interposed and provision made for grinding, by removing washers of thin paper, previously placed between the cutter and washer, as at *C*. It is not necessary to form teeth on both faces of the cutter, as shown, but it is generally preferable to do so; for when the faces (*D*) are worn out, it is only necessary to interchange the cutters to bring the other sides into operation, and thus save the expense of making new ones. When teeth are formed on only one face of each cutter, and when two are used as in the above case, they must be made right and left. In other words, when both are held in the same position, the cutting faces of the teeth of one should stand opposite those of the other.

A number of equally simple operations are illustrated in Fig. 11. The rounding of edges and corners, as shown at *A*, results in more uniform work than is possible with a file, and less than one-third of the time is required. The operation at *B*, if performed

the operation at *G* are found in hand and slide rests of small lathes, and similar parts of other tools. To secure uniformity in these operations, two cutters should be used—one to rough out the stock as much as possible, and another to take a finishing cut.

Fig. 12 shows a simple and handy appliance for use in connection with the vise. It consists of a square piece of cast iron several inches in length, bored to receive a shaft or spindle to be split at one end or both ends as shown; or to have a series of holes or flat places made at right angles with or directly opposite each other. The slot *t* runs the entire length of the piece, and a small screw is inserted at *s* to slightly hold the work and prevent its turning while in the shell. By the use of this device hexagon and square bolt heads may also be finished to size after the body of the bolt or screw is finished, without danger of marring. When a large number of pieces are to be slotted and finished, or otherwise treated, this method will be found very efficient. The manner of operating on the work and holding the piece or shell in the vise, is shown in Fig. 13. After the first cut is taken, the shell is given one quarter of a turn, and so on, if necessary. To divide the work into 3 or 6 equal parts, the shell is made hexagonal in section.

* * * * *

When the face of the mill does nearly all the cutting, as in Fig. 64, the teeth should be so formed that the cutting action will tend to force the work downward, and thus secure a better bearing than when otherwise. But as the feed is always from left to right, the mill, revolving as it does in this case, is necessarily a left-hand one. Much work is faced and otherwise operated on in this way that is often awkward and difficult to handle in any other. For this purpose face mills of 6 or more inches diameter are often made, as in Fig. 65. A blank in the form of a cast iron disc is cut as shown, to receive square pieces of steel, milled into shape and hardened to serve as teeth. These are placed in the grooves and held firmly in place by headless screws passing through a wrought iron band, shrunk on the disc after the grooves are cut. If the teeth are formed from round steel the holes may be drilled, and the wrought iron band dispensed with. The cutter so formed may be screwed on a short arbor, or held thereon by a set screw passing through a boss formed on the back of the disc.

Work of the kind represented in Fig. 66 may be found in nearly all classes of steam machinery, and will scarcely need explanation. Where such parts are made in large quantities, as is frequently the case in building small engines, steam pumps, &c., the operations may be best effected by use of gang mills. In this case, after the valve is faced, and the exhaust passage finished, the remaining work may be done with a face mill, or, if the valve is not too large, straddle mills may be arranged so that two cuts will complete the work, and secure uniformity in a greater degree than if done otherwise. By use of the end mill ports of small cylinders may be worked out, and much work of a simular character very readily performed.

When a number of pieces, as in Fig. 67, are to be bored and faced on one side, a boring and facing bar is made, as in Fig. 68; the cutters *c c* coming in contact with the side of the work after the cutter *a* has passed through. When a projecting boss is to be finished on the outer surface, as well as bored and faced, the part *b* may be enlarged to carry the cutters necessary to do the work.

Operations similar to those shown in Figs. 69 and 70 may be readily performed by using the hand wheel previously spoken of, after the work is properly marked out. When all the fillets are of one radius the work is best done by adapting the cutter to the same. In Fig. 71 a cut is started at each end of the rod to furnish a starting and stopping place for the planer tool, if the rod be too long to be completed by the milling machine; but if not, it is preferable to do it with the milling machine, as then a good surface is secured and a finish (if required) obtained by little or no draw-filing.

We take pleasure in noting the preliminary organization of two associations devoted to the fraternal union of railway employes for mutual benefit. On the Northern Pacific there has been formed the Northern Pacific Mutual Benefit Association, whose object is mainly the provision of relief for sick or disabled employes. The plan of operations, scales of benefits, etc., are to be formulated this month. Life insurance will not be a feature of the association for the present, but will be so eventually in all probability.

On the Union Pacific the "Pioneer Employes Union Pacific Railway Company" have organized with a somewhat different purpose than that of the Northern Pacific staff, the objects aimed at being principally of a social nature. It is proposed to cultivate friendly and social relations, and give moral and material aid to its members.

Both associations start out under favorable auspices, and promise well for the future. They deserve encouragement, as do all organizations of their class. Railway staffs are better off financially and morally where these associations flourish. — *The Railway Review.*

The officers of the Railway Master Mechanics' Association, for the current year, are as follows: President, Reuben Wells, Louisville & Nashville; First Vice-President, James Sedgly, Lake Shore & Michigan Southern; Second Vice-President, Howard Fry, New York, West Shore & Buffalo; Secretary, J. H. Setchel, Kentucky Central; Treasurer, S. J. Hayes, Illinois Central.

France used thirty thousand barrels of cider in making wines last year, but a French bottle of cider with a cobweb twisted around it will always catch the American wine-bibber. —*Detroit Free Press.*

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NEW YORK, AUGUST 26, 1882.

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Taxes on Manufacturing Establishments.

The recent session of Congress, at which an enormous amount of money has been appropriated for various purposes, some of them of trivial importance, brings prominently forward the question of restraining the extravagant expenditure of public money by municipal authorities, thereby checking the annual swelling of taxes upon manufacturing establishments and other forms of property. Taking the increase of national expenditures as a guide and example, State, county and municipal governments have become more and more lavish in voting away the people's money on one or another pretext, until business interests have just cause for alarm over the growing burdens thrust upon them. It may be urged by some that this is a matter which concerns few but professional politicians, but the proprietors of manufacturing establishments, at least in one of the smaller cities of this State, where the taxes have increased until they equal the legal rate of interest (6 per cent.), are quite ready just now to express a contrary opinion. They had neglected to take much interest in the local government, assuming, probably, that their immediate business required their exclusive attention, until they found recently a mountain of municipal debt to be lifted, and a virtually bankrupt treasury to depend upon. They would be only too glad to sell out and move elsewhere, but who is willing to buy manufacturing property in such a city at anywhere near its original cost? It would have required far less trouble on their part to have prevented, by concerted action some years ago, the reckless extravagance of local officials than it now requires to extricate themselves from the difficulties that surround them.

The expenditures of the General Government weigh less heavily upon individuals than county or even State expenses; but when any large appropriation is made by a city government its direct effect upon individual taxpayers can be observed. If it is commendable business sagacity to economize by improving the steam machinery, thereby saving coal and repairs in machine shops, mills and factories, is it not wise to use some efforts to prevent an increase of taxes that would more than swallow up all the saving in making and using steam economically?

True, taxes must be met and paid when once levied, and complaining will not modify them, but proprietors of manufactories acting together for mutual benefit have no insignificant power in checking the squandering of public money by municipal authorities.

In not a few manufacturing towns they could almost if not wholly prevent it.

The evil exists in many cases because large municipal debts were quietly contracted before the taxpayers had become sufficiently interested to examine matters closely Many towns are now inviting manufacturing establishments to locate within their borders, and are offering land, subscriptions to stock and in some cases exemption from town taxes for a term of years, to induce desirable industries to locate. In view of the experience of some towns it would not be surprising for the conductors of these favored industries to become apathetic to municipal extravagance during their term of exemption and only discover their property to be heavily encumbered (with that of their neighbors,) when the period for paying taxes arrives. The gradual but sure accretion of taxes has driven a number of large factories out of badly governed cities into the country within the last few years, and others have been induced to remain only by effecting compromises in regard to assessments. Many of the older and larger cities are in anything but an enviable position as to local taxation, and it behooves the promoters of productive industries in new towns to be vigilant in guarding against following their example.

The Channel Tunnel works at Dover, England, are being continued, it is stated, with very satisfactory results. The total length of the heading is now stated to be considerably above 2,000 yards.

Machinists' Wages in Great Britain.

"As a result of an agitation amongst the Edinburgh and Leith operative engineers extending over some weeks, says the *Engineer* of Glasgow, all the principal engineering firms have granted to their employés an increase of ½d. per hour, and so making the present rate of wages 6½d. per hour, for 54 hours per week. It is not expected that any strike will take place, as the demands of the men have practically been conceded all round. The engineering trade of Edinburgh and Leith is at present very brisk, and several heavy contracts are in hand in some of the local works."

If it requires "some weeks" agitation when engineering business is "very brisk" in free trade Great Britain for machinists to get their wages raised from $6.81 a week to the munificent sum of $7.08 a week, how long would it probably take after the adoption of the "tariff relief" measures, which some daily papers are clamorous to get passed by Congress, for American machinists to have their wages cut down from $12 or $15 a week to the *advanced* figures just reached by a long agitation in Edinburgh? Under our present tariff of 40 per cent. on machinery, machine tools and textile machines are imported to some extent. Were it taken off or largely reduced, a disturbance not at all beneficial to mechanics or manufacturers might naturally be expected. True, the foreign machinery builder would hardly find his most ardent customers among those of our citizens who are already familiar with his wares in comparison with those made at home, but this is a large country and it is not the work of a few short months to impress their relative merits upon the whole people when the element of unusual low price suddenly stands out boldly before them. Something would have to give way were the tariff cut down in the way proposed by the self-styled "reformers," and it requires no logarithmic formulas to figure out pretty conclusively what it would be.

Literary Notes.

THE FIRE PROTECTION OF MILLS, AND CONSTRUCTION OF MILL FLOORS. Containing TESTS OF FULL SIZE WOOD MILL COLUMNS. By C. J. H. Woodbury. John Wiley & Sons, 15 Astor Place, New York. Price $2.50.

The author in his introduction to the book whose title appears above, says: "The fire tax is the heaviest single tax in this country; the cost of fire insurance and fire departments together has amounted to over one hundred and twenty-five million dollars annually during the last five years. If the losses can be decreased, the cost of insurance will diminish in like ratio. Most of this vast sum is the price paid for incompetent management and hazardous construction and the means for its diminution are wholly within individual control." In order to accomplish this result, Mr. Woodbury has given an account of the best known apparatus which has proved to be of the greatest practical value in the various severe tests to which they have been subjected. Abstracts from the manuscripts that go to make up this book have been published with illustrations from time to time. In this very excellent treatise on the fire protection of mills, the arrangements for the defense of property against loss by fire are under four heads, as follows: The first is in anticipating all preventable causes of fire by having reliable employés upon whom to place heavy responsibilities, and to trust them with implicit confidence.

The greater portion of fires that occur might easily be prevented by the timely interference of a responsible person, while there are some that seem to be absolutely unavoidable. The second division is a description of the best methods for fighting fires by the organization of employés into fire brigades, to be worked under the best known systems for such purposes.

The third branch forms a comprehensive description of the design, construction and arrangement of the best known mechanical appliances for supplying water and distributing it in the most economical and effective manner to extinguish fires. Under this head are given the results of extensive experience and experiments in the arrangement of apparatus, and in the organization of different systems.

Under the fourth head is considered the best arrangement and a proper selection of materials and designs in the construction of buildings in order to make them slow burning, it having been demonstrated that "a fire-proof mill is a commercial impossibility." The book is well written, well printed, and contains tables, formulæ and results of experiments with materials upon the Watertown Testing Machine.

WILLIAM HEDLEY, THE INVENTOR OF RAILWAY LOCOMOTION ON THE PRESENT PRINCIPLE. George Thompson Dickinson, 13 Otterbun Terrace, Newcastle-upon-Tyne, England.

The book whose title appears above contains a biography of William Hedley, who first advocated "the law of gravitation as the true basis of locomotion," or in other words, built and run the first locomotive in 1813, having smooth wheels, running upon a smooth rail. An engraving is given of the first successful experiment tried with a four-wheeled car having a pinion and crank with a man to turn at each of the four wheels. There were platforms for the men to stand upon, and the car was weighted with heavy blocks of iron to give it tractive force to draw a train of loaded cars after it. The principles of the modern locomotive according to the authorities quoted in this book were first promulgated by William Hedley. During the keelmen's strike in 1812, upon the Tyne, it is said Mr. Hedley raised a locomotive off its wheels, and having a keel brought to Newburn, he had the locomotive fixed on board and paddles attached. This keel was used in towing the craft down to the ships and back to the dock, and was the means of ending the strike. This is said to have been one of the first steam-tugs on the Tyne.

In 1812 Mr. Hedley proposed to sprinkle ashes on the track, as sand is now distributed from the modern sand-box. The appendix to this book contains newspaper accounts and the opinions of different writers, which, together with the account of numerous experiments made, are highly interesting. One of these experiments was upon a new locomotive in May, 1813. It was placed upon the Wylam railway, and had a return tube boiler, with steam blast, besides plenty of steaming capacity for performing heavy work—a requisite that is lacking in many of our modern locomotives. This experiment antedates Stephenson considerably, although he has been accredited by many as the originator of both these improvements. In regard to the ability of Mr. Hedley, it is said that he was the inventor of the locomotive which was long known as "Puffing Billy," built in 1812 or 1813, and which was in actual work at Wylam Colliery in 1862, in which year it was removed to the Kensington Museum. Had this locomotive not been a splendid piece of work, it could never have continued in successful use for so many years.

What led Mr. Hedley to turn the exhaust steam into the smokestack was to deaden the noise. His plan was to pass it through an intermediate chamber. It answered the purpose, but produced an unlooked-for and very desirable effect by increasing the draft. The exhaust pipe at this time was of a uniform diameter from the cylinder to the end.

Upon the discovery of the beneficial effect upon the draught, Mr. Hedley found that he could greatly increase the power of his boiler by contracting the orifice. This practically amounted to the introduction of the exhaust nozzle. And it is said that when the locomotive was running, sparks flew from the smokestack in such quantities that hedges were set on fire.

One of the best evidences that George Stephenson did not discover the blast pipe is the fact that he makes no claim to this invention in any of his patents, as he would have been likely to have done on account of its great value had it belonged to him. It is a little singular that within the past two years extensive experiments were tried upon the locomotives of the elevated railroad in New York City, by passing the

exhaust steam through chambers on its way to the smokestack for the sole purpose of deadening the noise. The most remarkable feature about it is a patent was granted upon the device.

An almost inexhaustible supply of emery stone has been discovered near Shimersville, Pa., according to a report in the daily papers.

A new weekly paper, called *Justice*, has been started under the auspices of the Anti-Monopoly League. Judging from the contents of the two numbers before us, we opine that its conductors believe in the element known as "personal journalism."

The Industrial Exhibition now in progress at Denver, Col., is a marked success, no less than ten thousand visitors being present one day soon after the opening.

QUESTIONS & ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common sense methods.

(282) J. N., New York, asks: Will you please inform me if there has ever been built a steam engine of 12,000 horse power? *A.*—Not that we are aware of.

(283) J. J. O., Toronto, Canada, asks: Is there a material that will soften hard cast iron in the ladle before it is poured into the mould? *A.*—We know of nothing you can use in the way you suggest to make soft castings from hard iron.

(284) A. G. W., Philadelphia, Pa., asks: Can I cut a thread 13-16" pitch with gears 128 and 38, the lead screw being 4 threads to the inch? *A.*—No. 13-16" pitch corresponds to 1 3-13 threads to the inch, and the gears you name will cut: 128 : 38 :: 4 : 1 3-16 threads to the inch.

(285) I. H. H., Sing Sing, N. Y.: 1. What constitutes a No. 6 double thread? *A.*—A double thread cut with the lathe geared to cut 6 threads to the inch. 2. Which is the stronger, a V thread or a square thread? *A.*—If each is properly proportioned we do not think there would be much difference.

(286) P. K. A., Coatesville, Pa., asks: 1. Have the Baltimore and Ohio R. R. Co. shops of their own, and if so, where are they located? *A.*—They have shops at Baltimore, Md.; at Martinsburg, W. Va.; at Pittsburgh, Pa.; Newark, Ohio and at other places. 2. Do you think I could get in their shop to finish my trade, having already served two years? *A.*—We cannot say. You can only find out by making application.

(287) C. R., Laredo Station, Texas, asks: Will you please tell me what is the best way to filter water from a river before pumping into large tanks for railway service? *A.*—It is customary to filter the water after pumping. A basin could be constructed into which the water could be filtered through gravel beds before pumping, but it would hardly be as well as pumping into a filtering tank, or probably large settling tanks would answer the purpose.

(288) J. W. S., Lancaster, Pa., asks: 1. Is there any accepted length for indicator cards, and if so, what is it? *A.*—No. It is customary to proportion the length of the diagram somewhat by the rotative speed. With a slow rotative speed the cards may be taken 5" or upwards in length; with higher speed 4" to 4½" is a good length, while for still higher speeds the length may be reduced to 3", or even to 2". 2. Under what circumstances are the different springs of an indicator used? *A.*—With fairly high rotative speed it is a good plan to use a spring marked one-half the steam chest pressure; that is, for steam chest pressure of 80 pounds use a 40 spring. With very high speed it may sometimes be advisable to use a heavier spring, and at very low speed it may be better to use a lighter spring. 3. How much as a rule is the motion of the pencil multiplied? *A.*—Four times.

(289) A. B., Philadelphia, Pa., asks: Can you inform me whether in tempering a piece of steel that has failed to get hard in some places the heat will have the effect of further drawing the soft parts to a certain temper; for instance, I harden a piece of steel, and require the temper to be a red, but find that the tool has become very hard with the exception of one place, and that place seems to be hard enough for my purpose. Now while I am drawing the hard part will the soft part become still softer, or will the soft part remain as it is until the hard part is reduced to the same temper, and then become lower together as the heat becomes greater? *A.*—It will depend upon why one spot is soft while the rest is hard. If it is owing to uneven heating, you may succeed in drawing to substantially a uniform temper. If it is owing to inequality of the steel, the spot now soft will probably be quite too soft for your purpose by the time you have the temper of the hard parts properly drawn.

(290) W. K., Chattanooga, Tenn., asks: 1. Are there any conditions in which an engine may be placed as ordinarily used for driving machinery where cushioning may be entirely dispensed with to advantage, the piston speed being 400 to 500 feet per minute? *A.*—It is generally held by engineers that cushioning to some extent results in the saving of steam, and in bringing about smooth running. If an engine was strong enough in all its parts to resist the strains without cushioning, it would probably not be so economical in the use of steam, and would be more liable to heat than if cushioning judiciously was practiced. 2. What is the cause of the loops in the diagram as shown in the sketch at A? I have noticed this several times lately on the

diagrams taken from one end of a 16"x42" "Corliss" engine. *A.*—We have never heard the cause of this explained. We have ourselves on different occasions noticed this on diagrams from long stroke engines, expanding low and using wet steam, the loops, however, not being quite so prominent as those shown in the sketch. At one time in particular on an 18"x42" engine, about every fifth diagram from the outer end of the cylinder would have a loop on it, and by listening carefully something like an explosion could be heard, apparently in the indicator cylinder. We explained it on the theory of water accumulating in the indicator cylinder under the piston, which when the pressure was sufficiently removed (by expansion) was converted into steam so suddenly as to momentarily increase the pressure under the indicator piston.

(291) G. L., Ottawa, Canada, asks: 1. Must every joint on railway lines be loosened and tightened Fall and Spring in consequence of the expansion and contraction of the rails? *A.*—No. Elastic washers are used under the nuts upon each bolt so that the nuts cannot be screwed up tight enough to prevent the free expansion and contraction of the rails. The nuts have to be frequently tightened, as they are worked loose by the violent jarring of the plates as the trains pass over them. 2. Could fish plates be cast steel? *A.*—Yes.

(292) E. H., Dover, N. H., asks: Is a knowledge of the machinist's trade absolutely necessary to enable one to become a marine engineer for harbor and river boats? *A.*—No.

(293) S. F. W., Baltimore, Md., asks: When a locomotive runs around a curve, which wheel slips, the inner or outer wheel, and on which is the greater weight thrown? *A.*—In passing a curve the centrifugal force throws the greater weight upon the outer wheel, which in addition to the flange friction will cause the inside wheel to slip the most.

(294) F. H., Newark, N. J., asks: Will you advise me which is the best for durability and economy of fuel, the vertical boiler or the horizontal return flue boiler set in brick work. Conditions as to setting and material being the same. *A.*—The horizontal boiler.

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We will pay 25 cents each for copies of the American Machinist for January 1, 1881, which are clean and in condition for binding. American Machinist Publishing Co., 96 Fulton street, New York.

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MANUFACTURES.

New car shops are to be erected at Stony Island, Ill., near Chicago, for the New York, Chicago & St Louis railroad.

The Bridgeport Malleable Iron Company, of Bridgeport, Conn., is to erect the largest factory in the place. Two million bricks will be used.

The Harlan & Hollingsworth Company, in Wilmington, Del., has bought the old Stotsenburg Foundry, which will be repaired and added to the works.

The steel used in the manufacture of watches at Waterbury, is made in Pittsburgh, and has been selected as being the best for the purpose that could be obtained.

The car shops of the Chicago & Northwestern Railroad at Oshkosh, Wis., are to be removed to Chicago, on the ground that they can be more economically run.

R. A. Belden & Co., Danbury, Conn., have recently put a number of new drops and hammers in their Drop Forging Department, doubling their facilities for that work, running 12 hours a day.

Rome Steam Cotton Mills, Rome, Ga., are putting in their new machinery. The 7 boilers will be set with the Mahoney Furnace Improvement and fitted with the Corrugated Grate Bars.

William Tod & Co., Youngstown, O., are employing eighty men in the foundry and machine shop. Work is progressing on their new addition to be used for erecting heavy machinery.

Several New York capitalists are to examine a new mowing machine recently perfected by C. W. Cheney, of Athol, Mass., and consider the prospect for manufacturing.

F. H. Grote & Co., East 14th St., New York, are setting their new boiler, 60 inches diameter, with the Universal Patent Furnace. Their two boilers now in use will soon be reset with the same improvement.

The New Castle, Pa., *Democrat* says: "A Pittsburgh company has purchased three acres near the old fair grounds south of this city, and will soon erect thereon a stove foundry which will give employment to about a hundred men."

Since the extensive manufacture of steel rails by the Bethlehem (Pa.) Iron Company, they have been using ores from Africa, Spain, England, and Elba Islands in the Mediterranean Sea, in addition to that brought from their own mines in Canada.

Hoerle Brothers, Naugatuck, Conn., are about to establish themselves in that place in the business of selling mechanics' tools of all kinds, and also in making such special tools as are not found in stock. They are both experienced tool-makers.

The Bethlehem, Pa., Iron Company has men employed on the foundation for a new foundry to be erected on the western end of the steel mill. The new building is to be 40x60 feet, and will be used far the casting of ingot moulds and other machinery in the steel mill.

The Iron Age Malleable Hardware Co. is the title of a newly incorporated company of St. Charles, Ill., the capital stock of which is $50,000. Citizens of St. Charles have raised by subscription the $3,000 necessary to secure the location there of extensive malleable iron works.—*Industrial World.*

The Iowa Farm Tool Co., of Fort Madison, are enlarging their works by adding 40 by 100 feet, 3 floors. The company's works now comprise 8 different shops, and with the new addition they will have ten. They employ 150 hands, and as soon as their improvements are finished will engage 25 more.

Some $15,000,000 has been added to the capital invested in cotton manufacturing in the Southern States during the last six months.

In our issue of August 12, 1882, through an oversight we stated that Skinner & Wood, Erie, Pa., expected to build sixty portable engines this year It should have been two hundred and sixty as two hundred have already been completed, and the probability now is that they will complete three hundred by the end of the year.

The Colorado Coal and Iron Company is now turning out 125 tons of Bessemer steel rails per day on a contract made last year for 30,000 tons, the contract price being $70 per ton for a part, and $65 for heavy sections. It is expected that the product will soon be increased to 150 tons per day.—*St. Louis Railway Register.*

The Graydon & Denton Manufacturing Co., corner Greene and Bay Streets, Jersey City, N. J., have just issued a new illustrated catalogue of 40 pages. This pamphlet contains descriptions of their novel products in the shape of Rock Drills, Air Compressors and Dynamic Steam Pumps, besides much valuable information in regard to the practical operation of this class of machinery with testimonials in reference to their use.

The South Boston (Mass.) Iron Works have nearly completed for their own use two 99-foot lathes, which are thought to be the largest and heaviest lathes in the world. They are made in six sections of thirty feet each. The head stocks and face plates weigh ten tons each, and each bed section ten tons. The completed lathes will each contain 600,000 pounds of iron. They are built specially for boring out cannon, but are adapted for all heavy work.

In the rolling mills of Pittsburgh there is a cash capital invested of $19,020,000, with a product amounting to $30,242,257. Previous to the strike there were 18,905 hands employed in these mills. In blast furnaces and other manufactories in iron, there is a capital of $5,157,000, a product of $9,286,493, and 2,511 hands employed. In steel, the capital is $10,170,000, the product $18,378,836, and 7,060 hands were employed in Pittsburgh.

The Globe Iron Works, Cleveland, O., are increasing their capacity by erecting a three-story brick building 120 x 101. One end of the new building will be arranged for an erecting room with tram railway on the roof, and containing three stalls with room for two of their marine engines in each. They employ about 300 men in the machine shop and seventy in the boiler shop. The steam rivet machine will strike a 40-ton blow with fifty pounds of steam.

Lodge, Barker & Co., Cincinnati, O., have lately issued the following circular: "In order to facilitate the sale of our 18 inch Lathes, we have completed arrangements to keep in stock Tools of eastern manufacture, and are now prepared to give estimates on fitting up a complete line of tools to parties commencing the machine business, and hope by strict attention to business, and fair dealing, to please our customers. We now have on hand a stock of Lathes of all sizes of well known makers, also Planers, Drills, Milling Machines, Cutting-off Lathes, Centering Machines, &c., which we can sell at the lowest market prices."

The National Manufacturing Company are making preparations to move into a new building now being fitted up for their special use at the corner of Tenth and St. Charles streets. In this building they will have the first and second floors entire, each 101x35 feet, lighted by continuous windows on two sides. This will give them one of the best lighted and most roomy machine shops in the city. This change has been made necessary by a demand for enlarged space, their trade having increased beyond the capacity of the old shop on Eleventh street. A number of new tools are to be put in for work on their new lumber measures and combination drawer locks.—*St. Louis Age of Steel.*

The Jarvis Furnace Co., of Boston have just completed arrangements with Alex. Bass of the Pioneer Iron Works, Brooklyn, N. Y., to take the agency of their furnace for the island of Santo Domingo. The proprietors of this furnace feel confident it is destined to make a great change in the making of sugar in the West Indies, as it has been demonstrated beyond doubt that fresh ground sugar cane, or wet bagaze can be burnt by this system without drying; thus making a great saving in the cost of fuel for making steam on sugar estates, also placing them beyond any liability of being obliged to stop boiling, if the season is a wet one. The Pioneer Iron Works are among the largest manufacturers of sugar machinery in the world.

Mr. Birkenhead, of the Mansfield Spindle Works, Mansfield, Mass, has added to his business of spindle making the building of an improved lathe intended to meet the wants of mill owners and machinists. It is not encumbered with back gears or screw cutting, and is extremely handy for boring and turning. This tool will be of service in such places where the lathes are unusually too large and heavy for any of the work. This lathe with countershaft weighs, with a 4-foot bed, 625 pounds. They are made with 4, 5, 6 or 8-foot bed. It swings fifteen inches over bed and 7½ inches over carriage; four speeds 1½ inches belt, or three speeds with 2¼ inches belt, as may be ordered. The cones are turned inside, hence they are balanced; large hollow spindles with taper bearings. The feed cones can be adjusted to suit length of belt. It has a self-acting stop motion invented by Mr. Birkenhead, so that a boy can run several lathes on special work.—*Boston Commercial Bulletin.*

Machinists' and Engineers' Supplies.

NEW YORK, Aug. 10, 1882.

The volume of busines in supplies seems to be all the dealers desire to give their attention to, most of their time being occupied in contriving some way to reduce the temperature.

Wrought Iron Pipe is difficult to obtain, some sizes being entirely out of the market. Prices same as last quoted.

The Pig Iron market is quiet and steady with prices firm. We quote Foundry, No. 1, at $26 to $26.50; Foundry No. 2, $24 to $24.50; Grey Forge, $20.50 to $21.50. The importation of Foreign Iron is moderate and is disposed of upon arrival. We quote Coltness at $26.50 to $27; Gartsherrie, $26.00 to $26.50; Glengarnock, $24.50 to $25; Summerlee, $26.00 to $26.50; Carnbroe, $24; Eglinton, $23.50 to $24; Langloan, $26.50. Copper dull at 18¼c. to 18¼c.; Banca Tin, 28c.; Straits and Malacca, 25c. to 25½c.; Billiton, 25c. to 25¼c.; Australian 24¾c. to 25c.; Spelter common, 5.50c.to 5.60c.; Refined, 8c. to 8¾c.; Lead, 5¼c. to 5½c.; Antimony, Hallett's, 11¼c. to 11¼c.; Cookson's, 13⅛c. to 13¼c.; Nevada, 12½c.

WANTED

"Situation and Help" Advertisements, 30 cents for each seven words (one line) each insertion. Copy should be sent to reach us not later than Thursday morning for the ensuing week's issue.

Mechanical Draughtsman wants employment, no objection to going East or West. Address Box 5, AMERICAN MACHINIST.

Wanted—Draughtsmen for designing machine tools. Also man to run roll grinding machine. Address R, box one, this office.

Wanted.—A superintendent for a first-class establishment working 250 men. Must be well up in all departments and have a thorough knowledge of automatic cut-off steam engines. Address, Competent, this office.

A mechanical engineer, at present manager in a machine tool manufacturing business, will soon be at liberty and desires a position. Is well up in stationary engine, tool and general designing and construction. Address A. J., Box G, Auburn, Me.

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Wanted—A man thoroughly experienced to take charge as superintendent of a Carriage Hardware Drop Forging establishment, must be competent to design and superintend. Address, stating experience and reference, Martin Weber, 360 Main St., Cincinnati, Ohio.

40-inch lathe for sale. One 40-inch x 12½ foot screw-cutting, Hewes & Phillips lathe. Will be sold cheap in first class order. Ohl & Co., East Newark, N. J.

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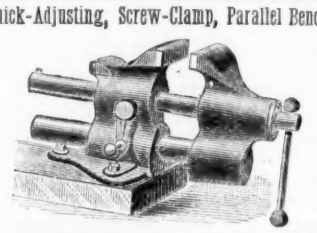

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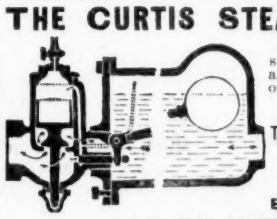

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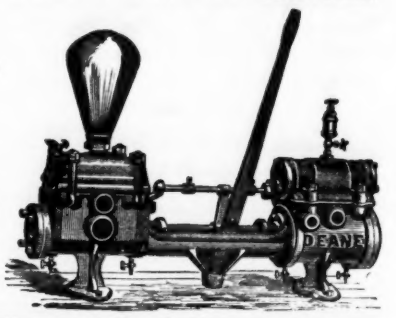

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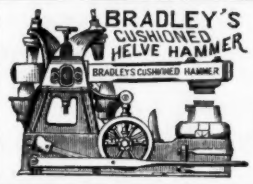

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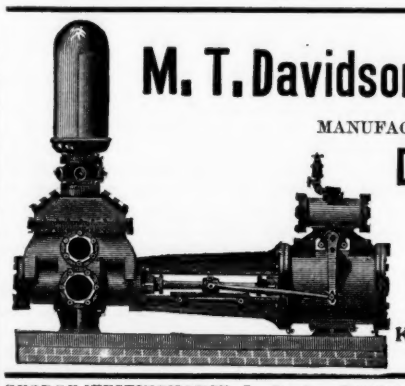

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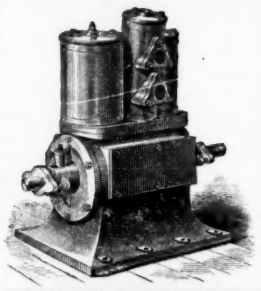

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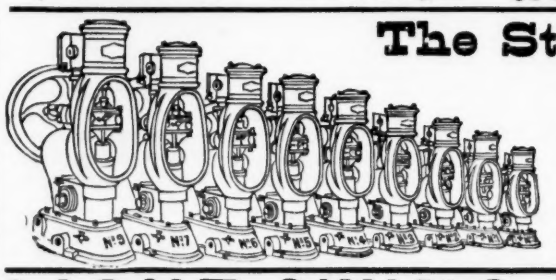

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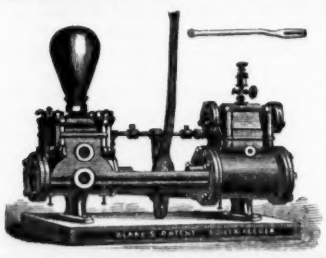

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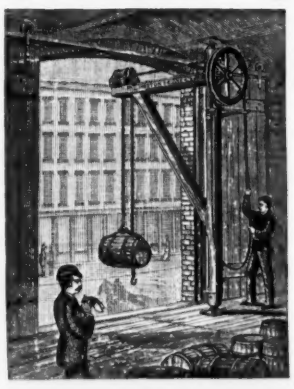

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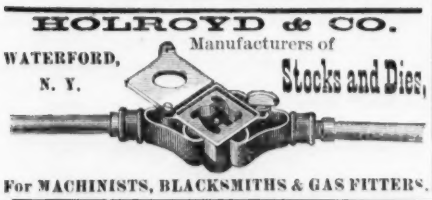

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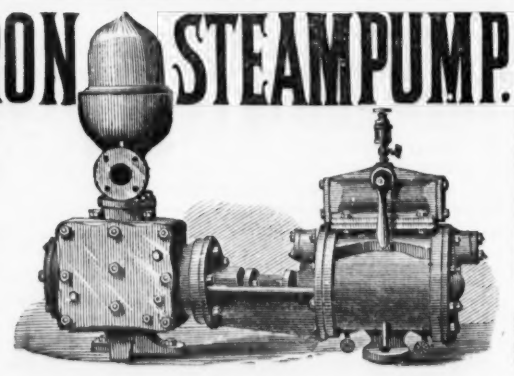

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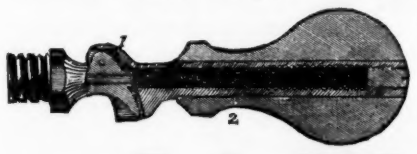

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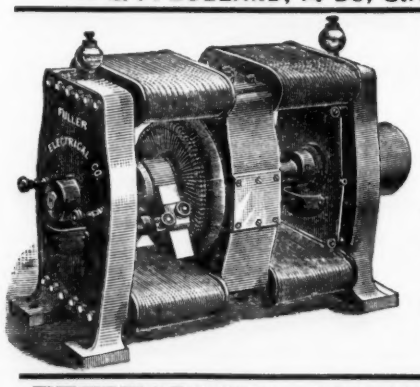

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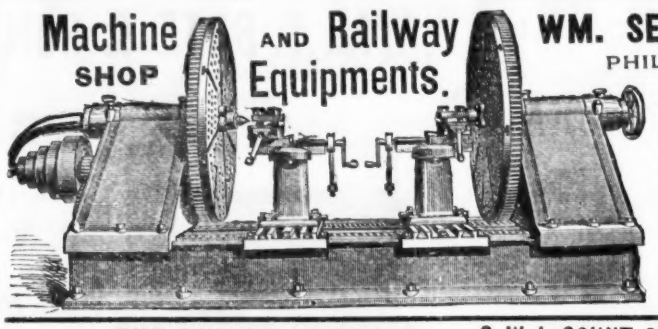

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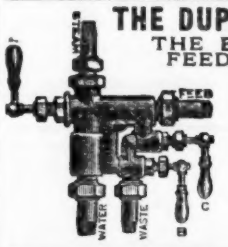

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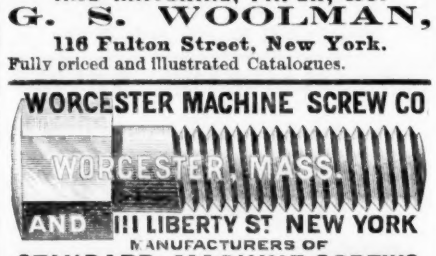

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" 11	1 3-4 "	1.25
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" 13	2 1-4 "	1.60
" 14	2 1-2 "	1.60
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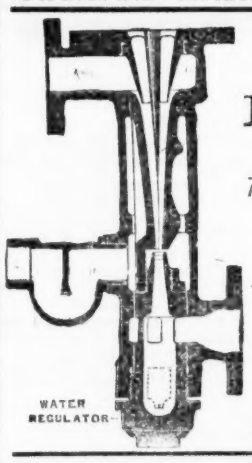

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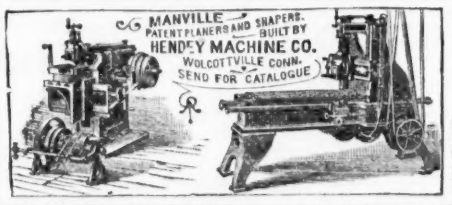

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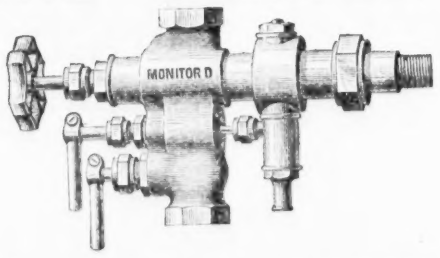

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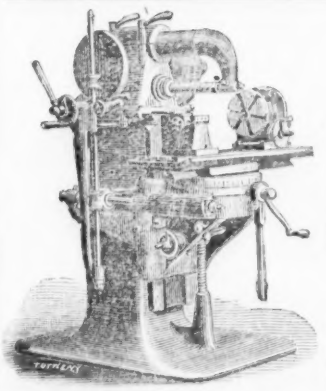

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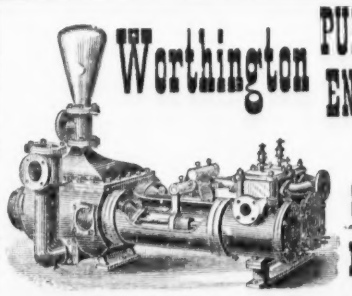

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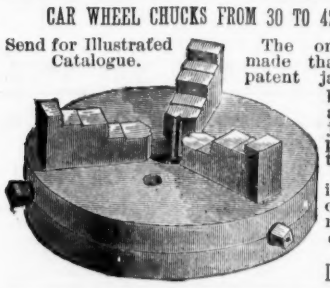

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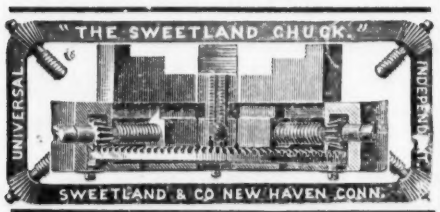

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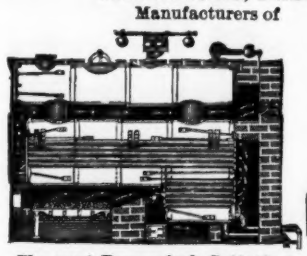

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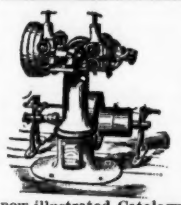

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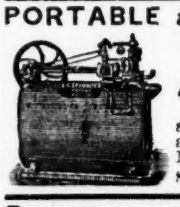

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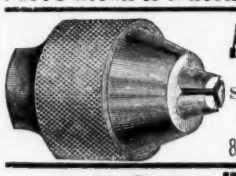

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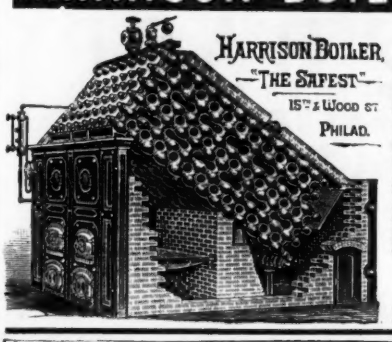

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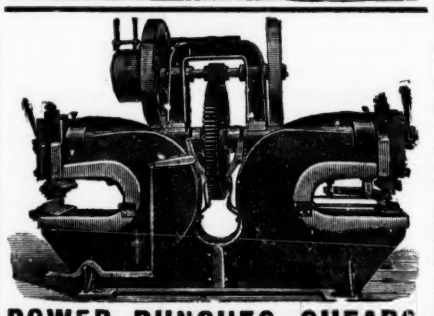

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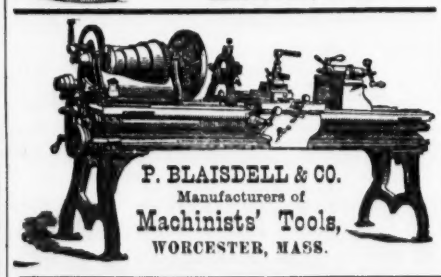

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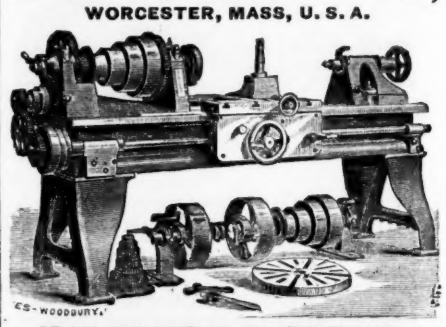

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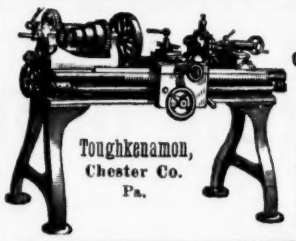

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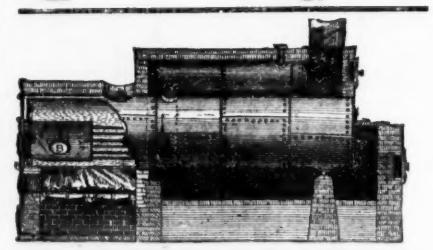

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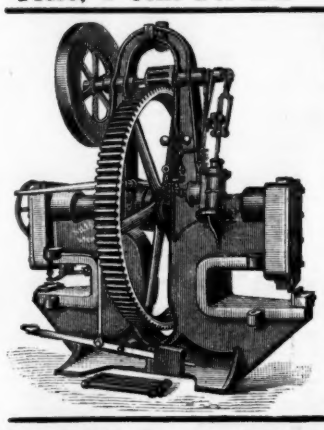

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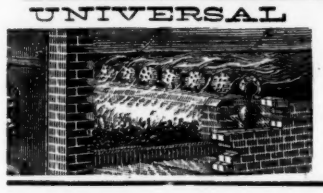

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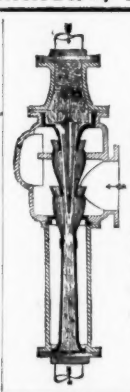

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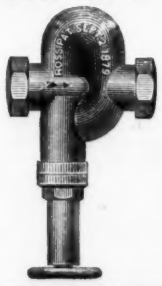

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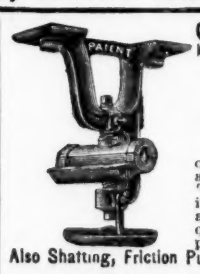

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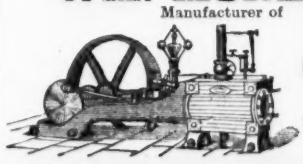

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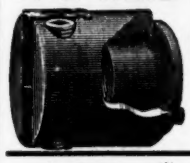

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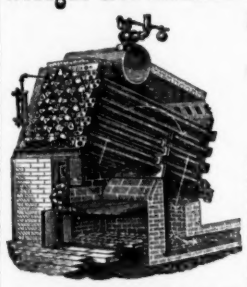

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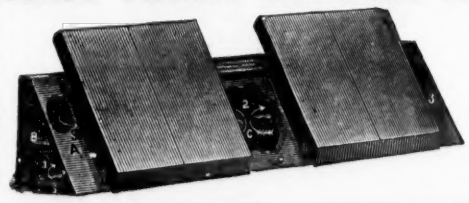

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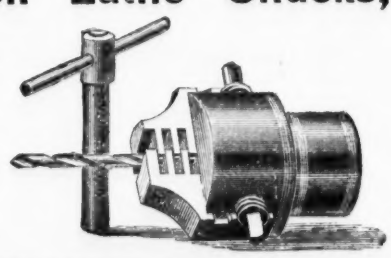

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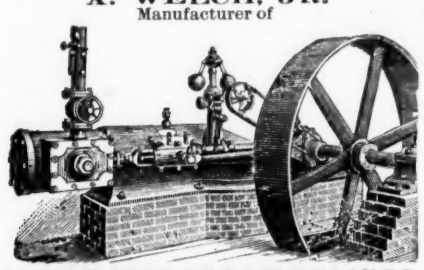

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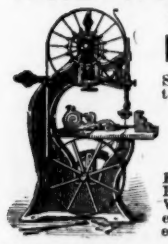

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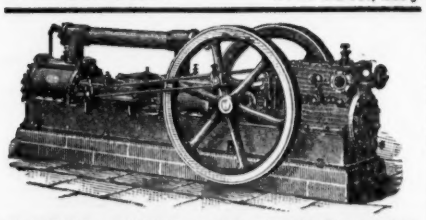

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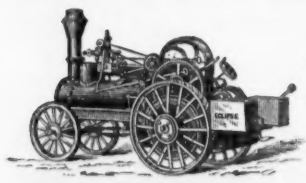

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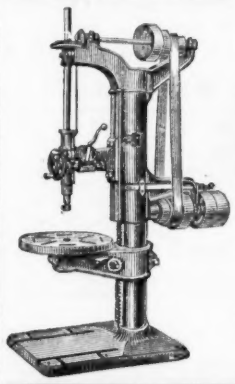

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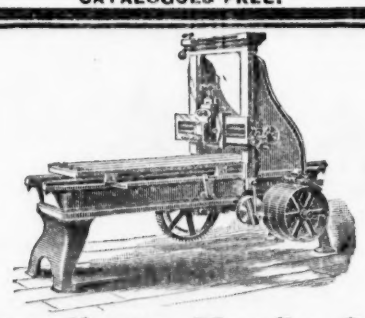

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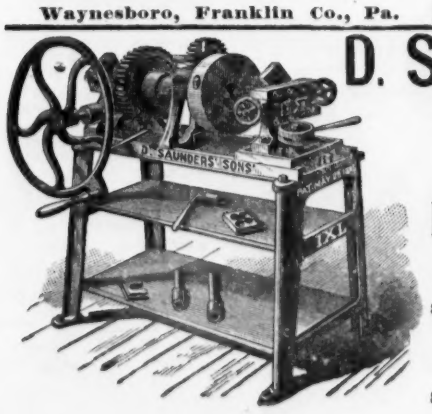

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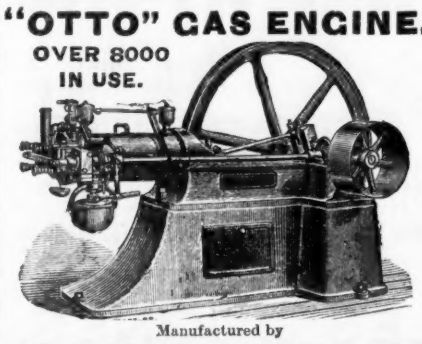

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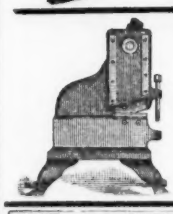

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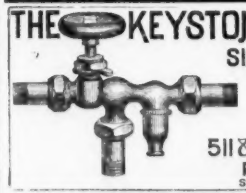

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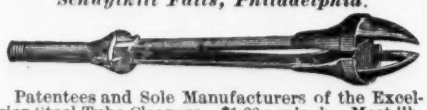

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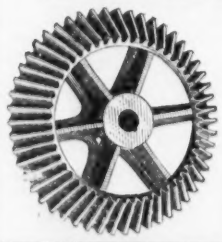

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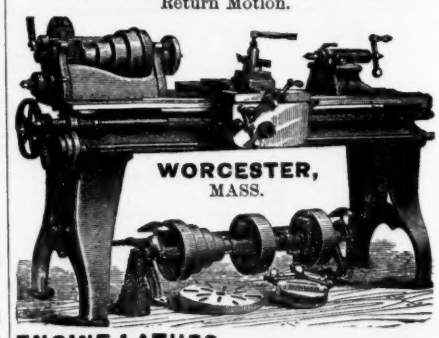

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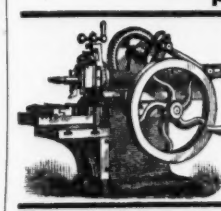

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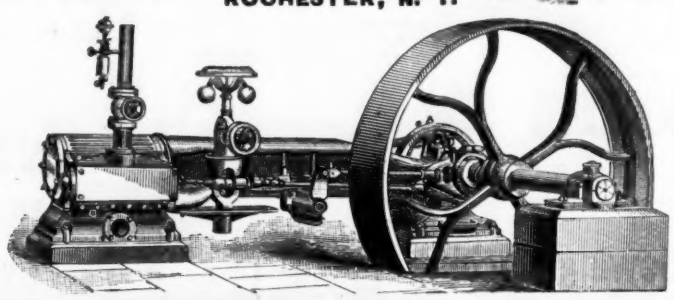

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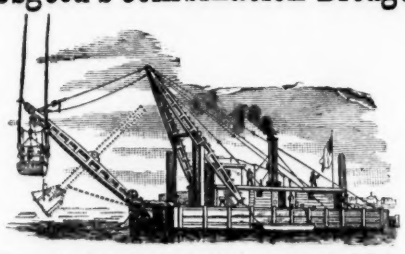

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SPECIALTIES.

Extra Heavy Bridgeport 16 in. Swing Engine Lathes.

SECOR SCREW MACHINES.

WRITE FOR WHAT YOU WANT.

E. P. BULLARD,

14 DEY STREET, NEW YORK.

NEW & SECOND-HAND MACHINERY. AUG. 8, 1882.

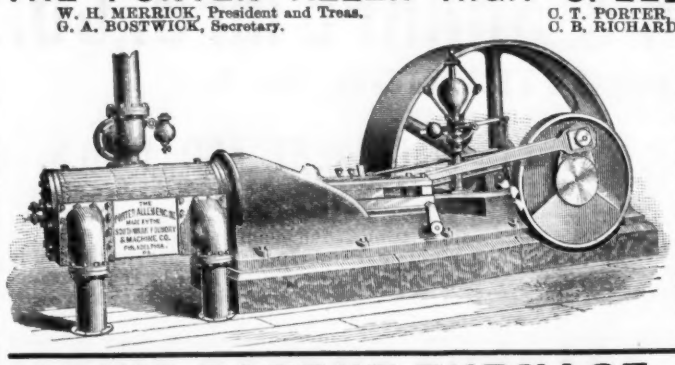
1 Engine Lathe,	14 in. x 6 ft.	Grant & Bogert.	New.
1 " "	42 in. x 14 ft.	New.	
1 " "	36 in. x 12, 17 ft.	New.	
1 " "	21 in. x 6 ft.	In good order.	Pond.
1 " "	18 in. x 8 ft.	" "	"
1 " "	14 in. x 6 ft.	Star Tool Co.	New.
1 " "	15 in. x 6 ft.		"
1 " "	14 in. x 5 x 6 ft.		"
1 " "	16 in. x 6, 7 & 8 ft.	Bridgeport.	"
1 " "	13 in. x 5 ft & 6 ft.	Ames.	"
1 " "	16 in. x6, 7 & 8 ft.	Ames.	"
1 " "	18 in.x8 & 10 ft.	Lodge & Barker	"
1 " "	24 in. x 12 ft.	Perkins.	"
1 " "	24 in. x 16 ft.	"	"
1 " "	30 in. x 16 ft.	"	"
1 " "	22 in. x 10 ft.	Fifield.	New.
1 " "	11 in. x 4 ft. & 5 ft.	Prentiss.	
1 " "	11 in. x 4 ft.	New.	
1 " "	12 in. x 5 ft.	Young.	New.
1 Plain Engine Lathe, 16 in. x 4 ft.			"
1 Engine Lathe, 15 in. x 4 ft.	Plain.	New.	
1 Fox Lathe, 15 in. x 5 ft.	Pike & Dean.		"
1 15 in. x 4 ft. Turret Lathe.	Lodge & Barker.		
1 Planer, 28 in. x 28 in. x 6 ft.	A1 order.		
1 " 36 in. x 36 in. x 10 ft.	Good order.	Wheeler	
1 " 16 in. x 16 in. x 3 ft.			new
1 " 24 in. x 24 in. x 6 ft.	Hendey.		"
1 " 26 in. x 26 in. x 7 ft.			
1 Upright Drill, 16 in.	Prentiss.		"
1 20 in. Upright Drill.	"		"
1 23 in. "	B. G. S. F. Thompson.		New.
1 24 in. "	Prentiss.	New.	
1 30 in. "	"	"	"
1 15 in. Shaper.	Gould & Eberhart.		"
1 15 in. Shaper.	Hendey.		"
1 Pratt & Whitney No. 2 Screw Machine.	Fair order.		
Garvin Millers Spindle Drills, &c.	New.		
1 Universal Tool Grinder.	D. Slate.	New.	
1 Schlenker Bolt Cutter to take sizes from ¼ to 1¼ inches inclusive.	New.		
1 Milling Machine.			New.
1 Nut Tapper, 7 Spindles.	New.	Durrill.	
1 Hand Lathe, 12 x 4, 5 and 6 ft.	New.		

NEW YORK AGENCY OF THE TANITE CO., AND GRANT & BOGERT MACHINE TOOL WORKS.

H. PRENTISS & COMPANY, 42 DEY ST., N. Y.

THE PORTER-ALLEN HIGH SPEED ENGINE.

W. H. MERRICK, President and Treas. C. T. PORTER, Vice-President.
G. A. BOSTWICK, Secretary. C. B. RICHARDS, Superintendent.

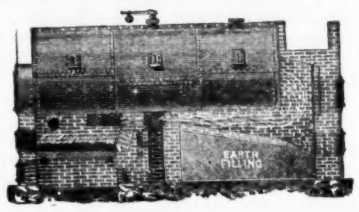


THE SOUTHWARK FOUNDRY & MACHINE CO., Philada., having largely increased its facilities is now prepared to fill all orders for the Porter-Aller Engine on contract time.

Orders solicited for Iron and Brass Castings in the rough.

Address the Company, 430 Washington Avenue, Phila., Pa.

JARVIS PATENT FURNACE FOR SETTING STEAM BOILERS.



Economy of Fuel, with increased capacity of steam power. The same principle as the SIEMANS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire. Will burn all kinds of Waste Fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, slack coal, &c. **A. F. UPTON, General Agent,**

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BERTON & NICKEL, New York Agents, No. 92 Liberty Street.

POND ENGINEERING CO., Western Agents, 709 Market Street, St. Louis, And 130 W. Second St., Cincinnati, Ohio.

CRAIG'S HYDRAULIC GOVERNOR,

FOR STEAM ENGINES,

The Most Perfect Governor Known.

RUNS IN OIL.

Guaranteed to accurately regulate all classes of engines. Illustrated and descriptive Catalogue sent on application. Correspondence solicited.

W. H. CRAIG & CO., Sole Manufr's, Lawrence, Mass.

—New York Agent—

A. ALLER, 109 Liberty St.

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MANUFACTURER OF

Machinery and Tools,

IMPROVED WIRE FEED SCREW MACHINES, GUN AND SEWING MACHINE TOOLS, DIES FOR DRAWING, FORGING, BLANKING, &c., MADE TO ORDER.

Manufacturer of

THE SECOR SEWING MACHINE,

Factory Cor. Broad & Railroad Ave.

BRIDGEPORT, CONN.

CORLISS ENGINES FOR SALE.

PROMPT DELIVERY.

One 12 inch Cylinder. 36 inch Stroke. At once.
One 14 " 36 " In two weeks.

APPLY TO

THE GEORGE PLACE MACHINERY CO.

121 Chambers & 103 Reade Sts., New York.

NEW & SECOND-HAND MACHINERY. August 14, 1882.

1 Engine Lathe,	14 in. swing x 6 ft. bed.		New.
1 "	"	11 in. swing x 5 ft. bed.	New.
6 "	"	12 in. " x 4 ft. "	New.
6 "	"	11 in. " x 3 ft. 6 in. bed.	New.

1 Back Geared Foot Lathe, 9 in. swing x 4 ft. bed, with Slide Rest and 2 Chucks, mounted on wooden bench. Second-hand. Good order.

2 Leader Foot Lathes. New.
Brigg's Foot Lathes. Nos. 1 and 2. New.
Polishing " Small and Large. New.
1 Upright Drill, 2 Spindles. Garvin. "
1 Sensitive Drill. "
3 Light Drilling Machines. "
A full assortment of Lathe Attachments, Countershafts, Chucks, Drills, &c., &c.

FRASSE & COMPANY, 62 Chatham Street, N. Y

IRON PLANERS, DRILLING MACHINES, ENGINE LATHES, IRON SHAPERS, ENGINES & BOILERS

A GENERAL LINE OF

IRON AND WOOD WORKING

MACHINERY.

TOOLS & SUPPLIES

In Store and to Arrive.

O. L. PACKARD,

Milwaukee, Wisconsin.

MACHINISTS' POWER TOOLS,

SCREW-CUTTING ENGINE LATHES,

Iron Planing and Shaping Machines,

UPRIGHT, HORIZONTAL AND RADIAL DRILLING MACHINES,

MILLING MACHINES AND BOLT CUTTERS.

HILL, CLARKE & CO., - - - BOSTON.

Western Warerooms, 800 North Second Street, St. Louis.

Second-Hand & New MACHINERY.

Aug. 8, 1882.

The following New and Improved Machinists Tools are part of what we have for early delivery

1 42 in. Swing, 16 ft. bed.	New Engine Lathe.	Aug. 10	
1 22 in. swing, 13½ ft. Bed Engine Lathes.			
1 26 in. swing, 14 ft. bed.	Aug. 1st.		
1 26 in. " 16 ft.	" "	"	New.
2 26 in. x 7 ft. Planers.	New.	Aug. 1st.	
1 32 in. x 8 ft.	"	"	Sept. 1st.
1 38 in. x 10 ft.	"	"	Aug.
1 38 in. x 12 ft.	"	"	"

The following on hand:

1 36 in. swing, 12 ft. bed Engine Lathe.	New.			
1 26 in. swing, 12 ft. Bed Engine Lathe.				
1 22 in. swing, 11½ ft. Bed Engine Lathes.	New.			
2 22 in. "	12 ft.	"	"	
4 19 in. "	8 ft.	"	"	"
1 19 in. "	10 ft. bed.			"
2 18 in. "	8 ft.	"	"	"
5 15 in. "	6 ft.	"	"	"
1 Square Arbor Fox Lathe.	New.			
1 15 in. swing, 9 ft.	Hand Lathe.	New.		
3 12 in. "	6 ft.	"	"	"
1 10 in. "	4½ ft.	Bed Hand Lathe.	New.	
2 30 in. x 8 ft. Planers.	New.			
1 26 in. x26 in. x 6 ft.	Planer.	New.		
1 22 in. x 4 ft. Planer.	New.			
2 38 in. Swing Upright Drills.	B. G. & S. F.	New.		
1 26 in. Drill.	B.G.&S.F.	New.		
1 18 in. Bench Drill.				
1 2 Spindle Drill.	New.			
1 4 "	"	"		
1 3 "	"	Second-Hand.		
2 4 "	"	"		
2 Wall Drills, heavy.	Second-hand.	60 in		
2 12 in. Shapers.	New.			
2 15 in. "	"			
1 Pratt & Whitney Hand Miller.				
1 Sellers Milling Machine.	2d-hand.			
1 Face Milling Machine.	Second-hand.			
1 Pond's Double Milling Machine.	2d-hand.			
1 No. 2 Screw Machine.	Wire Feed.	New.		
1 No. 1 "	Brown & Sharpe.	2d-hand		
1 Screw Head Slotter.	Second-hand.			
3 Second-hand Profiling Machines				
2 4½ in Hyde's Patent Centering Machines.	New.			
1 Emery Grinder, 2d-hand, for 10 in. Wheels.				
1 Bolt Pointing Machine.	Second-hand.			
1 Double Nut Tapper.	New Horizontal.			
1 Horizontal Boring Machine, 10 in. Swing.	2d-hand.			
1 Betts, No. 2, Power Punch.	New.			
3 Double-Acting Presses, No. 3, nearly new.				
4 Single-Acting Presses, for power,	"			
100 Foot Presses, nearly new.				
1 Medium Power Punching Press.	Second hand.			
2 Small "	" Presses.	"		
1 Foot Punch, with bench.	New.			
1 Lot Pistol Machinery.	Second-hand.			
4 Grind Stones and Frames.	New.			
1 Steam Hammer. Cylinder 6½x12.	2d-hand.			

Lot of Forges 1 Railway Saw Bench, 1 Foot-power Circular Saw.

Cold Rolled Shafting, Pulleys, Hangers, Couplings, &c., always in store.

The George Place Machinery Company,

121 Chambers and 103 Reade Sts., New York.

BROWN & SHARPE MFG. CO.

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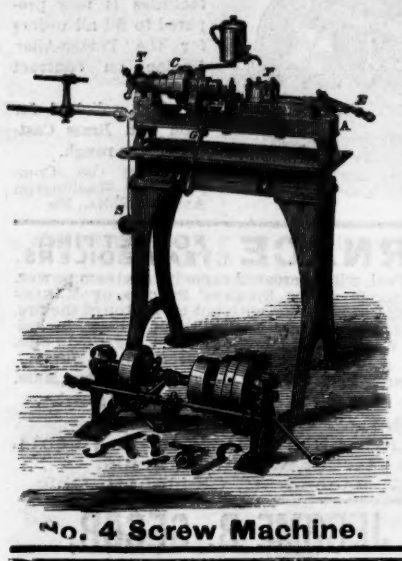
MACHINERY AND TOOLS.

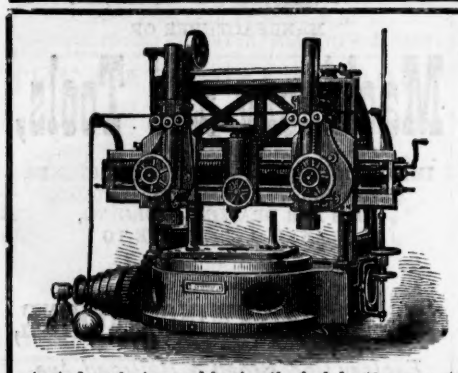


No. 4 Screw Machine.

The No. 4 Screw Machine is of the same general construction as the one previously described, but much lighter and especially intended for making the smaller screws that are used by sewing machine manufacturers, gun-smiths and clock-makers. The spindle has a hole bored through it seven-sixteenths of an inch in diameter, and is provided with a patent device for opening and closing the jaws in the chuck, which holds the wire from which the screws are made.

This operation of opening and closing the jaws of the chuck is performed in an instant without stopping the machine, and effects a great saving of time in making small screws. The revolving head is made entirely of steel.

Size of hole through spindle, 7 16 inch; size of holes in revolving head, 9 16 inch; length that can be milled, 2½ inches. Friction Pulleys on counter-shaft are 7½ inches diameter and 2½ inches wide. Counter-shaft should run 260 turns per minute. Weight of machine prepared for shipment, about 500 lbs.



Boring and Turning MILLS.

5, 6, 7, 8, 10, 12, 14 & 16 Feet Swing.

NEW PATTERNS.

Read the following Report of the performance of our Mill.

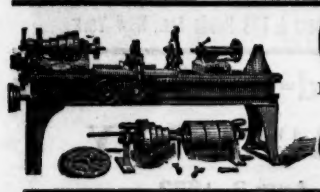
Salem, Col. Co., Ohio, Nov. 27, 1880.

We have just finished another pulley, 12"x27" face, weight 8860 lbs. Yesterday morning at 9 o'clock the rough casting lay on the floor by the mill and we commenced putting on the machine; got a cut started at 10.45 a.m.; finished the rim complete by 9.30 p.m., and got started on facing and boring the hub by 10 p. m.; started again at 7 a.m. this morning, and the pulley off at 11 a.m., 17 hours work all told, including handling on and off. The casting was not a very true one and we chose to take three cuts over the face. Hub was 18" deep, with straight core, bored to gauge and chamber on the machine. Hub faced on one side. If you hear of better time let us know—only 10¾ hours on the rim of pulley. Truly yours,

JOEL SHARP, PREST. BUCKEYE ENGINE CO.

NILES TOOL WORKS, Hamilton, Ohio.

Eastern Warerooms, 22 S. Sixth Street, Philadelphia, Pa.



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Built to Standard Gauges and Templates, with Special Machinery.

EVERY MACHINE BELTED AND TESTED.

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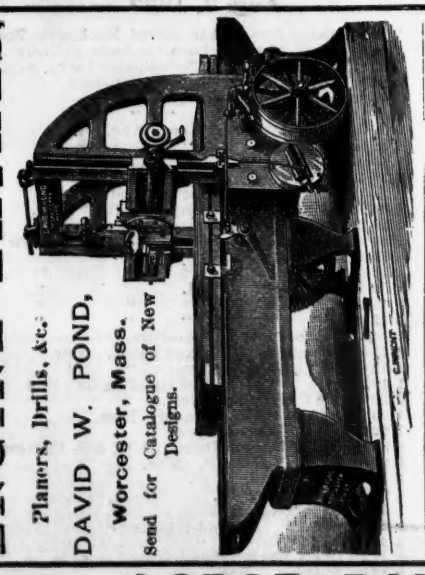
ENGINE LATHES.

Planers, Drills, &c.

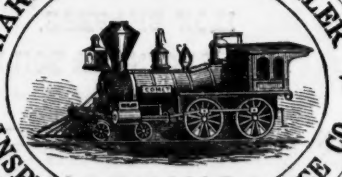
DAVID W. POND,

Worcester, Mass.

Send for Catalogue of New Designs.



HARTFORD STEAM BOILER INSPECTION AND INSURANCE CO.



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18-inch Swing Screw Cutting Engine Lathes,

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IMMEDIATE DELIVERY FOR VARIOUS LENGTHS.

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Having many inquiries for all kinds of Machinists' Tools, we have concluded to sell tools of Eastern make, and have put in a stock of lathes of different lengths and swing from the best Eastern makers. Also cutting-off lathes and centering machines, drills, planers, etc.

EX INUTILI TRADE TANITE MARK UTILITAS

Emery Wheels & Grinding Machines.

THE TANITE CO.

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Boston, Cor. High & Oliver Sts.
St. Louis, 209 North Third St.
St. Louis, 811 to 819 North Second St.
Cincinnati, Cor. of Pearl & Plum Sts.
Pittsburgh, 137 First Ave.
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GUN

AND

Sewing Machine Machinery.

MAKE SPECIALTIES OF

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PILLAR SHAPERS,

Power Planers

16 x 16 to 48 x 48 inches square, and various lengths. All feeds automatic.

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Of Every Description, from 1-16 ounce to 30 lbs. weight, for

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For the manufacture of all kinds of SHEET METAL GOODS, DROP FORGINGS, &c.

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Built to Order, and

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Shop well furnished for good work.

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Cutter Grinders, &c.

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ENGINE LATHES

FROM 16 to 48 IN. SWING.

Cuts, Photographs and Prices furnished on application.

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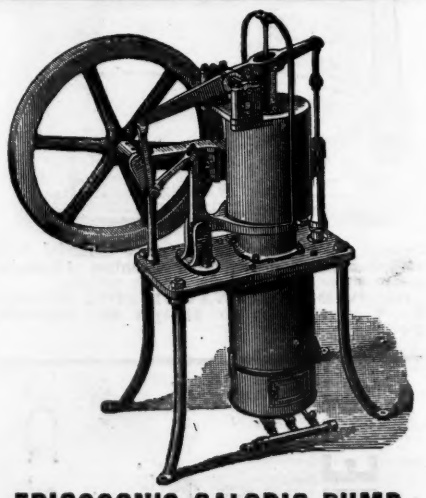

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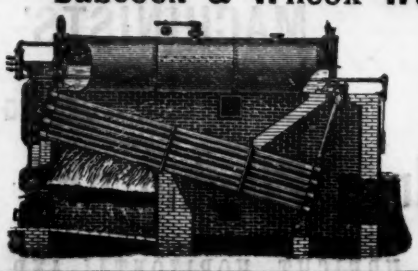

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Centennial Exposition Medal awarded this boiler for highest economy and efficiency on test.

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